



FRIDAY, MAY 20.

## NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

**Meetings Next Week.**—Burlington, Cedar Rapids & Northern.

**Elections.**—Ashuelot, A. B. Harris, President.—Denver Railroad Land & Coal Co., W. B. Parsons Jr., General Manager and Chief Engineer.—Nashville, Florence & Sheffield, M. H. Smith, President.—Sault Ste. Marie & Northwestern, N. C. Foster, President.—Illinois Central, Stuyvesant Fish, President.

**New Companies Organized.**—Arcadia & Monrovia files articles in California.—Baker City & Granite is incorporated in Oregon.—Bozeman & Butte Short Line is incorporated in Montana.—Cincinnati & Suburban Elevated incorporated in Ohio.—Dallas & Oak Cliff files charter in Texas.—Duluth, Pierre & Black Hills is organized in Dakota.—Kansas City & Independence Short Line files articles in Missouri.—Lawrence, Emporia & Southwestern files charter in Kansas.—Manayunk Branch obtains charter in Pennsylvania.—Minneapolis Terminal files articles in Minnesota.—Pasadena, Ramona & Long Beach is incorporated in California.—Shingle Springs & Placerville files articles in California.—Sioux Falls & Fort Dodge is incorporated in Dakota.—Tennessee Central & Alabama is incorporated in Tennessee.

**Changes and Extensions.**—Alabama: Alabama Midland contracts for building.—California: Nevada & California is making 57 miles extension.—Illinois: Indianapolis, Decatur & Springfield will build westward from Decatur.—Indiana: Louisville, New Albany & Chicago opens a 20-mile branch.—Indian Territory: St. Louis & San Francisco completes tracklaying from Fort Smith, Ark., to Paris, Tex.—Maryland: Cumberland, Moorefield & Southwest Virginia.—Massachusetts: Central Massachusetts extension is completed to Ware.—Montana: Helena, Boulder Valley & Butte begins tracklaying from Jefferson.—Nebraska: Chicago & Northwestern branch to Albion is completed.—Wisconsin: Sault Ste. Marie & Northwestern will begin tracklaying between Fairchild and Osseo.—Wisconsin: Chicago, Milwaukee & St. Paul institutes survey to Gogebic iron range.

**Leases and Sales.**—New York, New Haven & Hartford will lease the Stamford & New Canaan and the New Haven & Northampton.—Winfield & Wichita sells its franchise.

**Traffic.**—Anthracite coal shipments for the week ending May 14 show an increase of 8.7 per cent. as compared with corresponding week last year; bituminous shipments show increase of 80.3 per cent.; coke, for week ending May 7, shows decrease of 55.7 per cent.—Cotton receipts, interior markets, for week ending May 13, show decrease of 68.5 per cent. as compared with corresponding week last year; shipments show decrease of 50.5 per cent.; seaport receipts show decrease of 63.5 per cent.; exports, a decrease of 79.6 per cent.; cotton in sight is less than at same date last year by 42.5 per cent.

**Earnings.**—For the month of April, 65 roads report gross earnings, 51 showing an increase for the month, 14 a decrease.

**Miscellaneous.**—Houston & Texas Central will be taken out of Receiver's hands.—Missouri Pacific assumes control of Gainesville, Henrietta & Western.—Nashville & Florence and Tennessee & Alabama consolidate.—Schuylkill Navigation Co. obtains judgment against Philadelphia & Reading.—The Columbus, Hocking Valley & Toledo suits are begun.

## Contributions.

## Tight and Loose Coupling.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice articles in your paper from time to time relating to the car coupling problem, and the discussions are chiefly between the slack (or link and pin coupler) and the tight (or vertical plane coupler). The link and pin coupler men claiming that the slack is required, while the vertical plane men contend that no slack is required, and that they can haul as many, if not more, cars (with less damage) than the link and pin style can. Now, let us look at the subject in a practical way, and not depend too much on theory. The practice of some of the leading lines of railroads is that the engineer shall haul a certain number of cars in his train. With some roads it is twenty-six loaded cars, other roads, again, say thirty-four, shall constitute a train, each road varying in numbers according to the grades, curves, etc., in the road. Now, this being the case, and the number of cars based on the loose (or link and pin) coupler, which has a perfect freedom of motion, does it look reasonable that as many cars should be hauled over the same road with the tight (or vertical plane) coupler? For remember, the claim "tight" coupler means no slack except the compression of the springs, as with the loose (or pin and link) coupler. For illustration, a few years ago (1883) a train of twenty-six cars left Chicago equipped with a vertical plane coupler. The train was to run to New York without separation to ascertain the practicability of running such trains as fast live stock express. Being personally acquainted with the superintendent (who was a conductor on one of the leading railroads previous to the time of this trial), I asked him his opinion of the coupler in connection with the train. His reply was, "we could have made the run in ten hours less time if we had on a good common draw-bar, with a certain amount of

slack, just enough to lift us over the hills. We were stalled on a number of grades, and had to be pushed over by other engines." Now the vertical plane men claim that they obtain all the slack required in the springs. A very good point in the theory, but a very poor one in practice. Take, for illustration, the standard spring is 18,000 pounds compression; now, to compress the springs for the required amount of slack in a train of 30 cars would require a compression of 540,000 pounds. We will now see what the locomotive can do. In practical test, it has been found that locomotives have not traction force enough to compress one 18,000-pound spring. Thus clearly demonstrating that it would require over 30 locomotives to compress the springs for the 30 cars enough for the required amount of slack. The question would also arise, what would the vertical plane coupler do, supposing it should get "stalled" on a hill? They answer that they would apply the brakes on the rear three or four cars, compress the springs with the locomotive, and in that way obtain the slack, and when the cars had all moved forward (except the rear ones with the brakes set), the brakemen would release the brakes, and in that way they would get the required slack. The same practicable results would remain as in the former case; i. e., there is not enough traction force in the rear four or five cars (with the brakes set) to compress the springs; the result is they could not obtain the required amount of compression for the slack required. Now, in order to obtain slack of sufficient amount for expansion to the locomotive it is quite evident that it must have a loose slack in the spring pockets, which would answer as a substitute (temporary), but would in time cause as much trouble as the present system of too much slack. This being the case, I should think the proper course to pursue would be to ascertain how much slack was required, and then find the coupler that could determine to a mathematical certainty "that" amount.

C. E. MARK.

## Is Geographical Position a Vested Right?

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to your editorial of April 23, on "Difficulties of National Legislation," you say: "A has invested his capital in a city where he has low railroad rates, but high taxes, high rents and high-priced raw materials. B has invested his where raw materials are most easily obtained, where taxes and rents are low, but railroad charges high." Should not B have the benefit of his foresight in recognizing existing conditions as anomalous and likely soon to be changed? And was not A, in taking advantage of those conditions that are purely speculative, fluctuating and dependent upon the caprice of men, putting himself nearly in the position of one accepting a discrimination in his favor as against a neighbor in the same town?

As to the locality so far distant from market, that without special rates, they cannot ship at all, if, in its behalf, our sympathies are due, and the law is to be annulled, is it not simply because the state is at fault in hiring (by land grants and other subsidies) a railroad to scatter these people beyond the reach of reasonable rates of transportation, offering special rates as an inducement, and thus discriminating against those more favorably located geographically, whose property is taxed, or in part confiscated to meet this discrimination?

Thirty-five years ago, or when all railroads were built under special charters instead of under general laws, state control of common carriers was fully recognized. When New York by special law permitted the consolidation of the various short lines that formed the New York Central, no one objected to the state protecting its own public works by restricting the passenger charge to two cents a mile, and obliging the railroad company to pay canal tolls on freight during the season of navigation. Are not the property interests of the people paramount to those of the state? May not geographical position be a vested right?

Is it a hardship for a city or people to "take its place on the map according to its geography," as a newspaper of one Western city advised another city to do?

I have heard settlers complain because they were not permitted to take a homestead of 160 acres instead of 80 acres inside of railroad limits; and land-grant railroads themselves graduate the prices of their lands according to proximity to their line, and do not forget to raise the price when another company approaches or enters their limits.

Indianapolis and Atlanta have had the benefit of railroad competition and have made the most of it. If they finally conclude that some of it has cost them more than it is worth, it is one of the incidents of business that will have to be borne. The fact may only hasten the conclusion that their should be some tribunal to decide upon the necessity of a railroad before its construction.

Western Railroad, and Toledo, and following that road to or beyond Tipton, in Indiana, is a line of very heavy gas wells, which are said in northern Ohio to be producing nearly 100 million cubic feet per day. The Indiana field is much newer than the Ohio or Findlay field, and not so well developed; but its area is greater, said by Professor Orton to extend over 2,000 square miles of territory, and some of the wells, like the Anderson, Noblesville and others, have a daily estimated yield of about six million cubic feet.

The gas of Pittsburgh and southwest Ohio (Macksburg) is generally free from sulphur. So far all the gas from the limestone seems to contain sulphur enough to indicate its presence. The composition of the Pittsburgh gas, as determined by S. A. Ford, chemist of the Edgar Thompson Steel Works, and of the Findlay gas as analyzed for the Ohio Geological Survey by Prof. C. C. Howard, are given below:

	Pittsburgh gas.	Findlay gas.
Hydrogen	22.00	2.18
Methane gas	67.00	92.60
Ethylid hydride	5.00	
Oxidant gas	1.00	0.31
Nitrogen	3.00	3.61
Carbonic acid	0.60	0.50
Carbonic oxide	0.60	0.26
Oxygen	0.80	0.34
Hydrogen sulphide		0.20

Which give 125.8 grains of sulphur to 100 cubic feet. The heat units in 100 cubic litres of Pittsburgh gas are 789,694, and of the Findlay gas 878,082. This gives the Findlay about 11 per cent. more heating power than the Pittsburgh gas, and according to Professor Orton 36,764 cubic feet of Pittsburgh gas and 31,085 cubic feet of Findlay gas each equal 1 ton of coal. The Van Buren, Kary and Simons wells are each yielding over 12 million cubic feet per day or an aggregate of over 1,000 tons of coal, while a saving of 25 per cent. or more is claimed in the application of gas over coal.

Gas presents such advantages and economies in working iron, baking pottery, and glass working that Findlay and other gas towns expect phenomenal growths. No general effort seems to be made to make money out of the gas itself, but rather out of real estate, many of the towns having more or less control of the gas supply, and great pains are taken to prevent anything like a monopoly of gas producing territory, so that most towns are able to offer manufacturers free gas. Towns like Fostoria adding weighty subscriptions to the capital of works that come there. Others, like Anderson, in Indiana, offer free gas, free land and free water from the city works to manufacturers, hoping, in the words of the Indianapolis Sentinel, to create a young Birmingham there, an ambition which has our sympathy, as far as population and wealth goes, but it is to be hoped that their wares may never acquire quite the reputation implied by that name.

To what extent the advantages of rock gas will cause a redistribution of the industries of this country, and to what extent they will increase them, leaving the established factories where they are, cannot yet be decided. There has not only been no decrease, but a decided increase in the output of coal in western Pennsylvania and Ohio during the past year, and it may appear probable that, except in glass making, the only result will be an increase of manufacturing and consequently of freighting. But it looks as if glass works would all gravitate to the natural gas, and as the two largest and best deposits of glass sand in the country are at Sylva and Noblesville, near the two ends of this gas belt, the short transportation of the raw material will give the locality a fair chance to compete with the superior capital of Pittsburgh.

In 1880, the product of our glass works was valued at over 21 million dollars, employing 23,822 hands; last year our imports of glassware were valued at 5 million dollars, so there is an opportunity for a considerable expansion before we supply our own market.

## Baltimore &amp; Ohio Relief Association.

The sixth annual report of the Baltimore & Ohio Employes' Relief Association gives the receipts during the year from premiums as \$298,440, and from interest \$7,105; these added to \$140,669 on hand at the beginning of the year make the total \$446,216. The benefits paid amounted to \$220,897, and ordinary expenses were \$41,162, leaving a balance on hand of \$184,157, which is \$43,488 larger than at the beginning of the year. Actual liabilities of \$88,684, and an estimated reserve to provide for increasing ages of members (\$26,901) deducted from the balance on hand leaves the net assets \$68,807, about \$10,000 more than a year ago.

The membership is 20,297, a large increase having resulted from the opening of the Philadelphia Division of the road. The number of benefits paid during the year (including 58 for death from accidents) was 9,580, nearly one-half of the total membership, though doubtless many individuals appear in the list two or more times.

All persons employed by the Baltimore & Ohio are examined by the association's surgeons. During the year covered by the report 13,316 were examined, of whom 7.44 per cent. were rejected. Of the 2,783 examined for sight, hearing and color sense 171 (3.14 per cent.) were rejected. What portion of these 171 failed in the color sense is not stated. The association continues to distribute medicines to the employes; whether by the pound as curatives, or by the ounce as preventives is not stated.

During the past year 16 persons have been added to the pension rolls, making the total now 128. The savings fund and building feature is very popular, 653 new accounts having been opened during the year. Its balance-sheet now foots up nearly \$380,000. This department, in lending employes money with which to build houses, gives preference to those who have the best service record.

\*Preliminary report upon petroleum and inflammable gas reported for the author, Edward Orton, State Geologist of Ohio, with supplement. A. H. Smythe, Columbus, Ohio, 1887. 9"x6" 200 pages. Index and maps.

## Natural or Rock Gas.

The late discovery that rock gas is found in greater or less quantities over vast areas in this country, wherever a porous rock is covered by an impervious stratum of sufficient thickness and integrity to confine the gas, promises not only to diminish the cost of the comforts of life where the smaller reservoirs are found, but the larger supplies must affect the growth of established centres of population, manufacturing and distribution, and build up new centres.

Aside from the wonderful supplies of Pittsburgh, which for some time have been well-known, stores of gas are found from western New York and Pennsylvania at least to the shores of Salt Lake. At present all eyes are turned to the wonderful yields from the Trenton limestone in northwestern Ohio and Indiana. Commencing at Bowling Green, rather more than half way below Findlay, or the Lake Erie &

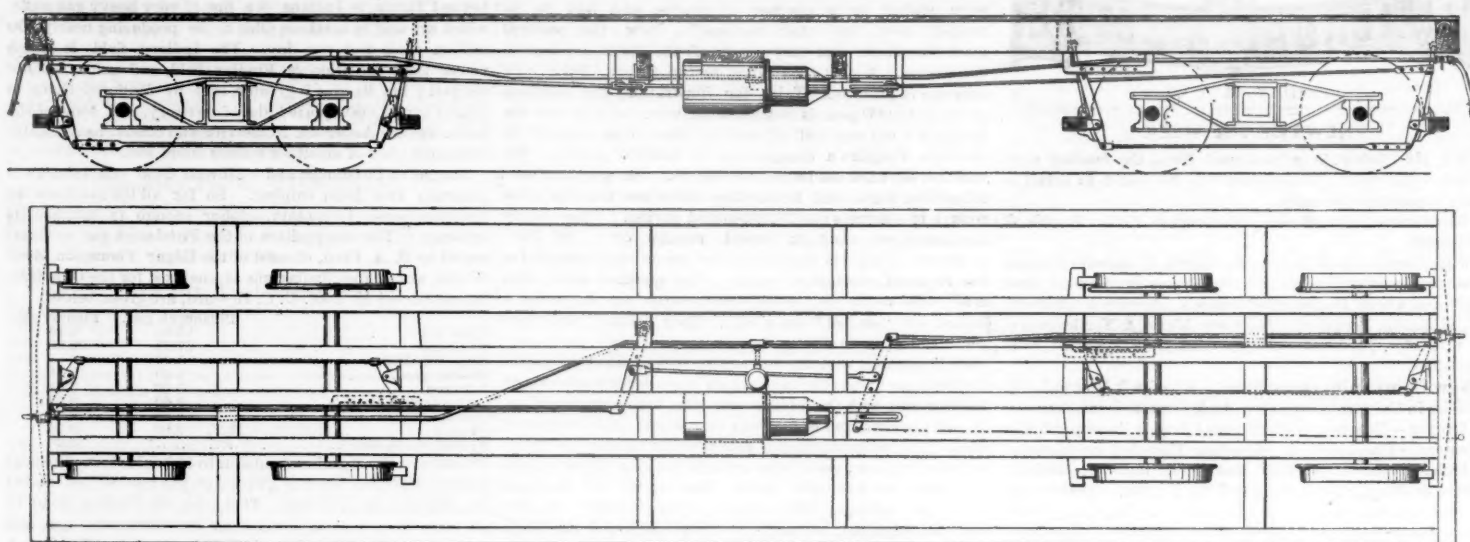


Fig. 1.—Arrangement for Cars.

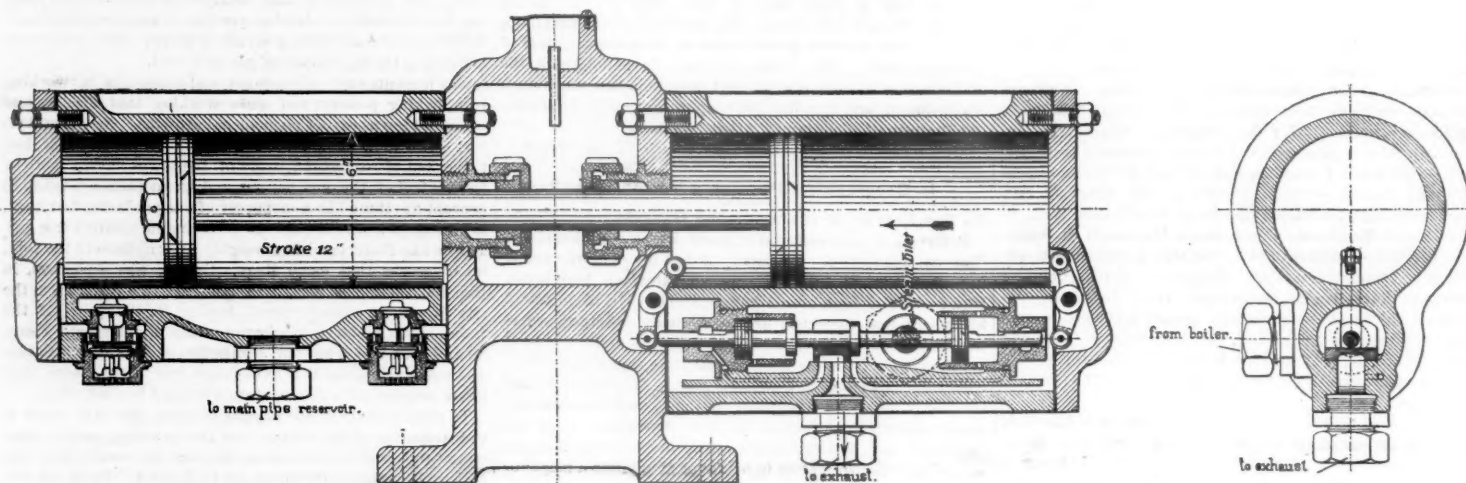


Fig. 2.—Air Pump.

## CARPENTER'S AUTOMATIC ELECTRO-AIR BRAKE.

## The Carpenter Electro Air Brake.

The accompanying illustrations represent the Carpenter electro air brake now undergoing test at the Burlington brake trials.

The brake is operated by electricity, one current being used to apply the brakes and another to release them. One insulated wire running the length of the train is used for the applying current and another similar wire for releasing. Both may be combined in one cable. The return current from both wires passes through the train-pipe, and through the shell of the coupling, a separate wire being used only through the rubber hose. The wires are placed inside the train pipe.

As previously explained in these columns, this brake is one of a class in which the power to force the brake shoes against the wheel is obtained by compressed air, and the valves controlling the compressed air are operated by electricity. An electric current energizes electro magnets under each car, attracting an armature, which lifts a small conical valve. This valve permits the escape of air from the top of a diaphragm. The unbalanced air pressure beneath causes the diaphragm to rise, and in so doing it moves a piston which permits air to flow from an auxiliary reservoir into the brake cylinder applying the brake.

As arranged on the trial train at Burlington, the valves shown in Fig. 3 are used. These enable the brake to be applied, released or graduated by electricity. The power with which the shoes are forced against the wheels can be either increased or diminished during the stop, a very valuable feature in a freight brake and one not obtained by any quick acting automatic air-brake. The brake can also be applied by a reduction of the pressure of air in the train pipe. It cannot, however, be released by air pressure. This can only be done by electricity.

The disadvantage of this arrangement is that should the electric connection be defective, the brake cannot be released without bleeding each car. The advantage is that the brakes on a long train can be released instantly, and can be released whether the train pipe be full or empty of air. After a stop a long train can be started again instantly without the time necessary to recharge the train pipe with air.

This system of release by electricity has also other advantages. As the restoration of full pressure in the train pipe does not release the brakes, the reservoir can be recharged, while the brake is applied, and thus the brake can be applied and released by electricity several times in quick succession without any serious diminution of pressure in the reservoir, as the engineman can keep air flowing into the reservoir during the whole time. This is of course very advantageous in running down long grades.

The electric current is not on continuously, and is only used momentarily when applying or releasing the brake. The brake is therefore not automatic as regards the electric feature, or, in other words, should the train part or a hose burst the brakes are not applied automatically by electricity, but are applied automatically by air. Precautions described below have been taken to guard against any short-circuiting or failure of the electric conductors destroying the power of applying the brakes on the whole train.

Should a hose burst or the train part the brake is applied automatically by the reduction of the air pressure. The brake is therefore operated, applied, released and graduated by "straight" electric currents, but in the event of an accident is applied automatically by the escape of air.

The Carpenter brake as used at Burlington differs considerably from that known by the same name in Germany. The Carpenter brake as used on all the express trains of the Prussian State Railways is an automatic air brake without valves. The brake piston has air on both sides, and when the pressure in the train pipe is diminished, the air on one side of the piston flows direct into the train pipe without the interposition of any valve. The pressure of the air on the other side of the piston, being thus unbalanced, moves the piston applying the brakes. The force with which the brakes are applied evidently varies according to the difference in pressure on the two sides of the piston and therefore the brakes can be graduated to apply either with increased or diminished force by merely varying the pressure in the main pipe. This brake, through simple in construction and convenient to handle, is necessarily slow in action on long trains, as both the train pipe and part of the cylinder have to be emptied of air in order to apply the brake with full force.

The Carpenter brake, as used at Burlington, differs essentially from that described above. A cylinder, separate reservoir and a duplex valve are used under each car, one valve for applying and one for releasing the brake, as shown in Fig. 4. The brake can therefore be applied and released very quickly irrespective of the length of the train.

The apparatus may be generally described as follows: An air-pump placed in any convenient position on the engine compresses the air into the main reservoir; from thence it passes through the engineer's brake valve to the tender, and from there on to the rest of the train in the usual way. The detail of the brake apparatus used on the tender is the same as that used for the cars. The detail of the driving-wheel brake apparatus, being so similar to that in common use, needs no further description. The automatic valve for operating the same is here placed for convenience under the engineer's cab.

A small secondary Julien battery, containing six cells having one ground connection and one connection to the

engineer's brake valve, conveniently located on the engine, furnishes the electromotive force for working the valves throughout the train. The handle of the engineer's brake valves has a detachable connection with the plug, and can be turned to make the electrical connections between the battery and the train wire without moving the mechanism used to operate the brakes by air; or the air-brake mechanism may be operated without making the electrical connections, the same handle being used in each case. The wires extending throughout the train may be laid either within or without the air-pipe and hose, and the simple act of uniting the latter also completes the electrical connections between the cars.

The general arrangement of the brake apparatus on a car is shown in fig. 1. The cylinder and auxiliary reservoir are bolted together, and to the automatic electric air valve. The main air pipe with the hose couplings and wires completes the equipment, the necessary connections with the brake rods being similar to those used for other air brakes.

The accompanying drawings, Fig. 4, show in detail the arrangement of the brake cylinder, auxiliary reservoir and automatic valve. This valvular apparatus contains two distinct main valves, as shown in separate sectional views. The first shows section through the brake valve A. This valve is used in applying the brakes, and can be operated either by means of an electric current or by reducing the pressure in the main air pipe. In either case air is admitted from the auxiliary reservoir into the brake cylinder applying the brakes. The other view shows section through the release valve B, which can be operated by an electrical current only to release the brakes. In each case an electro magnet being energized by it, will attract an armature and therewith a small conical valve; this exhausts the chamber above the diaphragm, whereupon the pressure beneath the diaphragm raises the latter, and therewith the brake valve A or the release valve B applies or releases the brake according as the handle of the engineer's valve is thrown forward or backward.

A four-way cock is placed near these valves. When placed in one position the brakes on that particular car are "cut out," or non-operative, and cannot leak on again, as the cock opens a communication between the brake cylinder and the atmosphere. This position, therefore, serves for bleeding the brakes. In another position the valves only are cut out, and a communication is opened from the train pipe to the brake cylinder, thus enabling the brake to be worked as a straight air-brake. In a third position the passages are in communication as shown, and the brake can be worked as an electro air-brake, as described. In order to effect this the passages have all to pass back and forth through the cock, giving the valve an appearance of complexity.

The valves shown in fig. 4, while applying and releas-

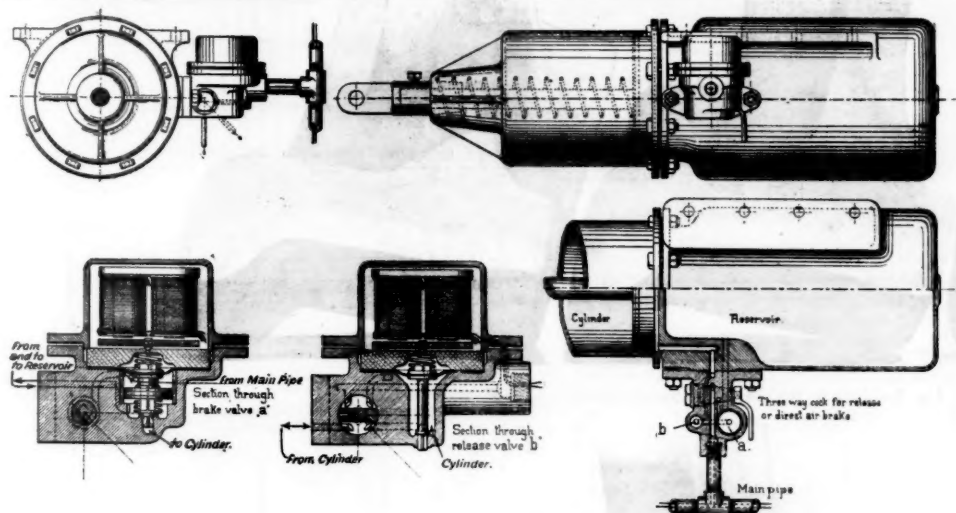


Fig. 4.—Apparatus for Car.

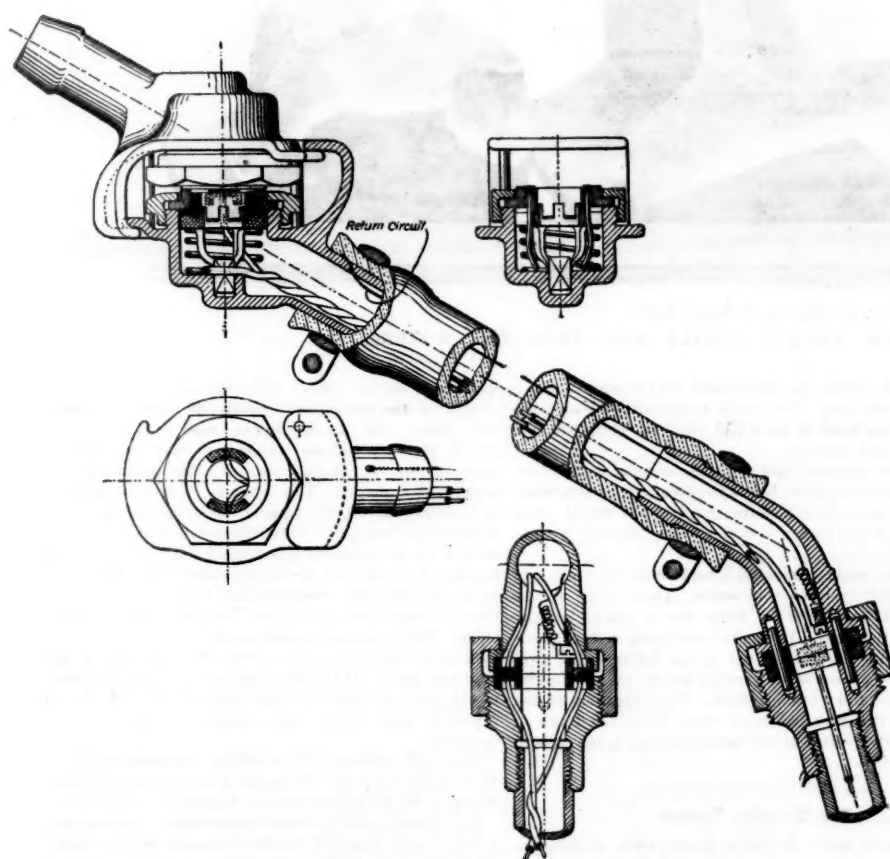


Fig. 5.—Electro-Air Coupling.

## CARPENTER'S AUTOMATIC ELECTRO-AIR BRAKE.

ing by electricity are capable only of applying the brakes by variation of the pressure in the main air pipe. The brake cannot be released by raising the air pressure in the main air pipe. The construction shown on fig. 3 does, however, accomplish this. It applies or releases the brake either by means of variation of the air pressure or by means of the electric currents. The principle of construction is substantially the same as the previous arrangement, but two diaphragms are used, so that the valve can be moved in either direction by either electricity or a variation in the pressure of air in the train pipe.

The hose connection here shown, while differing materially from the Westinghouse coupling, possesses the important advantage of being perfectly interchangeable with it, so that cars equipped with the two different brakes may be coupled together, and where valves capable of being operated either by air or electricity are used (fig. 3), it is evident that the two brakes can interchange without difficulty, and be worked as an air brake. It will be seen that in this coupling the electrical connections lie entirely within the hose, that the circuit is completed by simply joining the air couplings, and that a hose can be readily replaced, no separate joints having to be made for the electrical wires.

In any system of air brakes, whether actuated by electricity or in the older way, the air compressor or pump is a most important factor. It is claimed that the construction here shown, while being simpler and having fewer moving parts than the well-known Westinghouse pump, will not be found inferior in its efficiency, regularity of working or freedom from repairs.

When the piston arrives at the end of its stroke, it strikes against the levers shown in the ends of the steam cylinder. These levers have hardened steel anti-friction rollers. The movement of this lever carries over the valve stem a certain distance, without moving the main slide valve. The stem,

however, is moved far enough to let steam behind one piston on the valve and exhaust it in front of the other piston. Whereupon the live steam on the valve stem pistons completes the stroke of the valve stem, carrying over the main slide valve and reversing the stroke of the pump.

The valve stem pistons are cushioned just before the end of their stroke, the groove in the valve stem by which the exhaust is effected being of such a length that the exhaust is cut off just before the end of the stroke. The motion is such that there is no dead point, and the pump will start in any position. We understand that some 1,500 pumps of this kind are working in Germany.

It is claimed that the arrangement here described presents the following advantages over previous systems:

1st. The valves, being operated by electricity, can be called into action throughout the longest train instantaneously. This avoids all shock and enables the train to be stopped in the shortest possible distance consistent with the amount of brake force used.

2d. While working the valves electrically, communication is never cut off between the main reservoir on the engine and all the auxiliary reservoirs throughout the train, and therefore the air pressure can be sustained or continually replenished, regardless of the length of time or number of times the brakes are applied.

3d. The brakes being released by electricity, this can be done regardless of the air pressure momentarily existing in the main pipe or under the valves, so that what is technically called bleeding the auxiliary reservoirs to release the brakes, or the sticking of the valves for want of sufficient pressure on the engine to release them, is entirely avoided.

4th. The brakes can be partially released if, at first, applied with too much force, a feature which not only permits the better regulation of speed of the train, but also effects a large saving in the amount of air used.

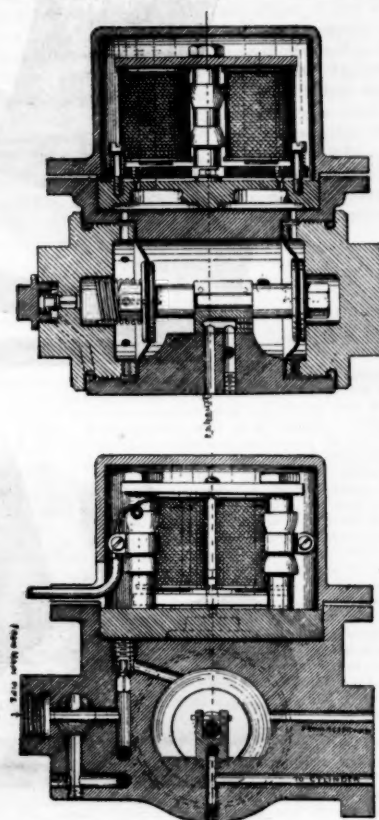


Fig. 3.—Electro-Air Valve No. 1.

Stress is laid upon the advantages accruing through the independent control of the valves hereby furnished, and it is claimed that the brakes being at the same time operable by variations in the air pressure, or in other words, the brakes being automatic through air pressure as heretofore, no element of danger or material complication is introduced through the addition of the electrical features.

The electro-magnets are connected in "multiple arc," and the electric current is used only momentarily while applying or releasing the brakes. The first feature avoids the necessity of a complete train circuit; that is to say, if the main wires or their branches are broken in any portion of the train, the brakes will work up to that point. The second feature so reduces the amount of electricity that a battery which, if used in a closed circuit would last only a few days, will here serve for a month or more.

## German Railroad Statistics.

The annual summary of statistics of German railroads, as collected by the Imperial Railroad Bureau of the German Empire, has been published for the operating year, 1885-6 and the following facts are taken from abstracts published in the German journals.

The total length of the German railways in operation at the end of 1885-86 was 23,160 English miles, against 22,704 miles in the preceding year, showing an increase of 455 miles. Of this total 19,022 miles (18,915 the preceding year) were trunk lines, and 4,138 miles (3,790 the preceding year) were branch lines. To this must be added 1,232.24 miles of annex lines for private purposes, and 238.66 miles of narrow gauge lines; 20,237 miles were governmental roads, and 288 miles were private railroads under governmental administration.

Of the governmental railroads, those in Prussia had, up to the end of 1885-86, a length of 13,188 miles; those in Bavaria, 2,782 miles; in Saxony, 1,272; in Württemberg, 959 miles, and those in Baden 802 miles.

Compared with the preceding year the network of railways throughout Germany increased from 6.74 to 6.88 kilometres for each 100 square kilometres, and from 7.90 to 7.94 kilometres for each 10,000 inhabitants.

There were in Germany, at the period reported for, 11 state railways or controlled by the state, 8 private railways under governmental control, and 51 private railways under individual control, making a total of 70 railway administrations.

The capital invested in all these roads amounted to \$2,430,526,632 (4 marks = \$1). Of this sum \$176,855,775 was invested in private roads under individual control, making \$67,122 per mile; \$24,593,092 in private roads under governmental control, or \$85,655 per mile, and finally \$2,229,077,765 in governmental roads, or \$110,148 per mile. The Prussian state railways represent of that last-mentioned value \$1,459,120,029, or \$110,639 per mile.

The trunk lines operated 12,450 locomotives, 22,735 passenger cars, 250,313 freight cars and 1,414 mail cars.

The state railways carried during that period 246,139,947 passengers, realizing \$35,644,268 from that source, or \$1.761 for each mile. The private railroads under governmental administration carried 2,282,985 passengers, having an income therefrom of \$472,176, or \$1.645 per mile, and the private railroads carried 27,038,013 passengers and had an income of \$5,009,405, or \$1.902 per mile therefrom.

The state railways carried during the same period 130,880,

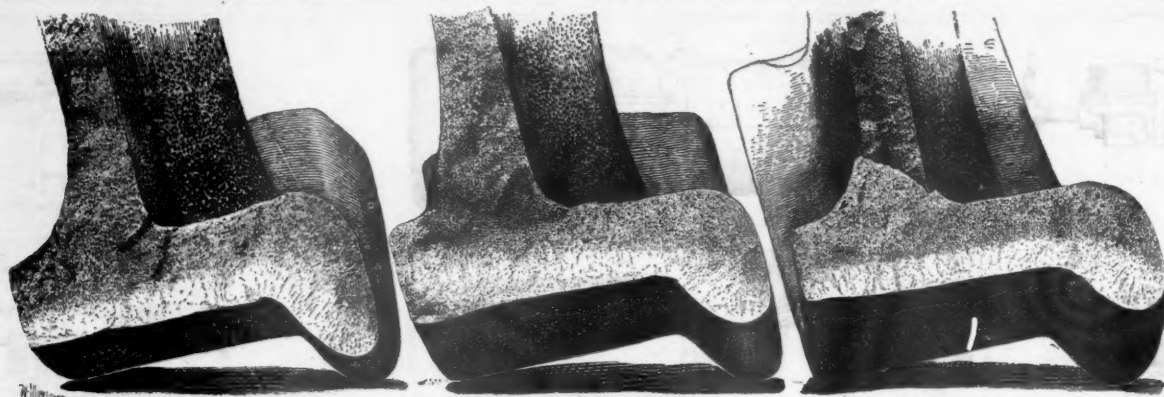


Fig. 1.—Cast in Whitney's Contracting Chill.

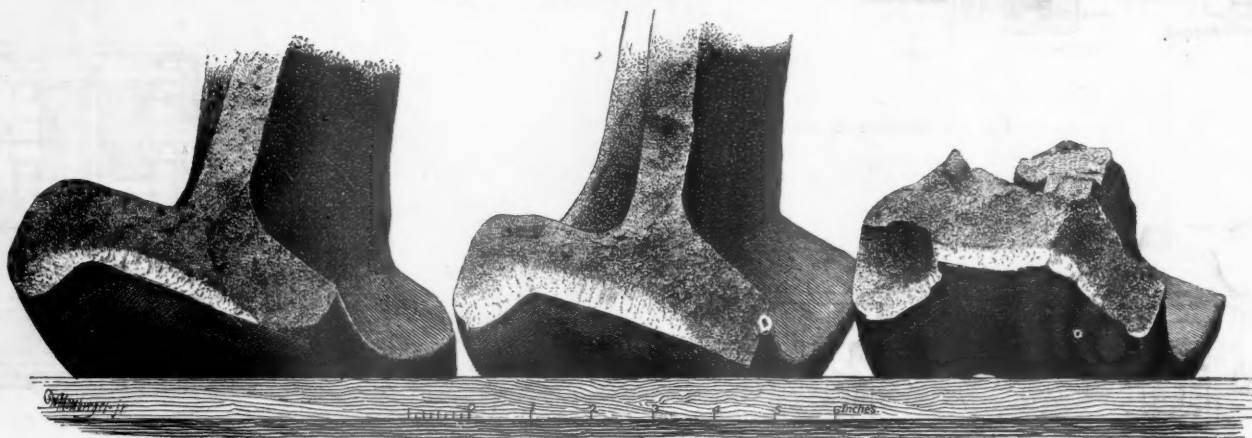


Fig. 2.—Cast in Ordinary Chill.

FRAGMENTS OF TWO 30-IN. CHILLED WHEELS MADE FROM ONE MIXTURE.

166 tons of freight, the income of which amounted to \$152,025,053, and the two other classes of lines respectively, 2,277,279 (income \$1,141,407) and 15,821,619 tons (income \$9,763,497).

The total income of the state railways amounted to \$230,330,253, or \$11,382 per mile; that of the private roads under governmental administration to \$1,888,361, or \$6,580 per mile, and that of the private roads to \$16,406,933, or \$6,225 per mile; together, \$248,627,947, or \$10,729 per mile.

The total expenses of the state railways amounted to \$129,919,942 (56.41 per cent. of the traffic income); those of the private roads under governmental administration to \$1,209,404 (64.05 per cent. of the traffic income), and those of the private roads to \$9,040,877 (55.09 per cent.), making a general total of \$140,170,023 (56.38 per cent.).

If the income from the traffic and the expenses thereof are reckoned, the interest on the invested capital of all German railroads will be found to be 4.42 per cent.

Of all the German railroad track, 11.3 per cent. was station and yard track, and of the remainder, 9,643.22 miles were single tracks, 10,827.58 miles double tracks, and 58.40 miles triple and more tracks.

The narrow-gauge roads are classed in ten groups, most of them to be found in Saxony and Silesia. They had 82 locomotives, 138 passenger and 3,293 freight cars; had an invested capital of \$5,124,925, or \$21,624 per mile; yielded an income of \$428,488, had \$235,045 expenses, or 54.22 per cent. of their net income, and a surplus of \$193,443, or 3.72 per cent. of the invested capital.

#### The Whitney Contracting Chill.

In the illustrations herewith are shown some fragments of two wheels cast at the same time and from the same mixture. The engravings are very accurately reproduced from photographs. The greater depth of chill obtained with the contracting chill is well shown, but not the more uniform depth. The wheel, some pieces of which are shown in fig. 1, had a chill practically uniform in depth all around, while that of which fragments are shown in fig. 2 had the chill twice as deep in some parts of the circumference of the tread as in others. Messrs. Whitney & Sons find also a greater uniformity in the circumference of wheels cast in the contracting chill, as from its construction it does not change so much in size with the temperature at which the metal is poured as does the ordinary chill. In a year's experience they have not found much more than 50 wheels of any given size which have varied more than  $\frac{1}{8}$  of an inch in their circumference, "while with the ordinary chills the variation formerly was often as much as  $\frac{1}{4}$  of an inch."

As every part of the contracting chill is of essentially the same thickness and density, and as there are no lugs or trunnions at any point, it is at once evident that every part will be heated and cooled alike in the daily use. The consequence is that the original roundness and size are retained in both the chill and wheel. As regards depth and uniformity of chilling effect, as there is no separation between the chill and the wheel in casting, by the expansion of the one and the contraction of the other, irons of good chilling qualities may be used with-

out the risk of making the plates hard, by having too high a temper in the mixture. The result is a good, deep and uniform chill on the tread of the wheel, while the plates are of a good, strong open grain.

The Whitney standard chill is a trifle larger than the Master Car-Builders' standard, but as the former contracts when the wheel is poured, and the latter expands, the wheel, when it begins to cool and shrink, is of the same diameter in both chills.

The Whitney contracting chill is made with two rings, one within the other, connected by webs. These rings are of about  $\frac{1}{2}$ -in. thickness, and the inner one is cut by kerfs or slots between the webs. In use, the outer ring is kept comparatively cool by the circulation of air between the two, and practically preserves its diameter during the time necessary to get the full chilling effect. The expansion of the webs between the outer and inner rings keeps the latter in contact with the wheel at all points as long as the chilling effects are needed.

#### The Simplon Tunnel.

At a conference held the 22d of March, 1886, of delegates from five cantons of Switzerland, from the Western Switzerland and Simplon Company and from the Swiss Railroad Bank, a commission was appointed to examine the various projects for a railroad over the Simplon Pass. The report of this commission has recently been published. The commission consisted of Messrs. Polonceau, Chief Engineer Material and Traction of the Orleans Railroad Co.; Doppler, Inspector General of the Austrian State Railroads; Huber, a civil engineer of Paris, and Dumur, civil engineer and formerly Director of Construction of the Servian Railroads. The experts, in their report, point out that the Simplon would make a very important saving in distance as compared with the St. Gothard and Mt. Cenis lines for traffic going from Paris to Milan, as well as between Boulogne and Plaisance—that is to say, for all traffic between the west of France or England and Italy. For traffic going from Belfort and Basle to Milan or Genoa the Simplon route can compete only in case there is no breaking of bulk and the pass is crossed at low altitude.

Notwithstanding recent improvements in the Fell system, the experts decided against this as being inadequate to carry the necessary amount of traffic, and because it demands special rolling stock, and would necessitate breaking of bulk in passage.

The project of M. Agudio is to cross the pass by a cable road, doing away with the tunnel entirely, protecting the line against avalanches by galleries of masonry. The experts estimated the cost of this project at 20,000,000 francs. They rejected it, however, on account of the difficulties of working, which would not permit the route to compete with the existing tunnel routes.

Another project proposed was that of Colonel de Bange, using a special motor, or bridge locomotive. By this process the tunnel would be approached on either side by a 10 per cent. grade, to be worked with the special motors, and these grades to be connected by a tunnel to be worked by ordinary locomotives. This proposed bridge locomotive is described as a colossal locomotive of 10 axles, carrying a horizontal platform on which are two parallel tracks 115 ft.

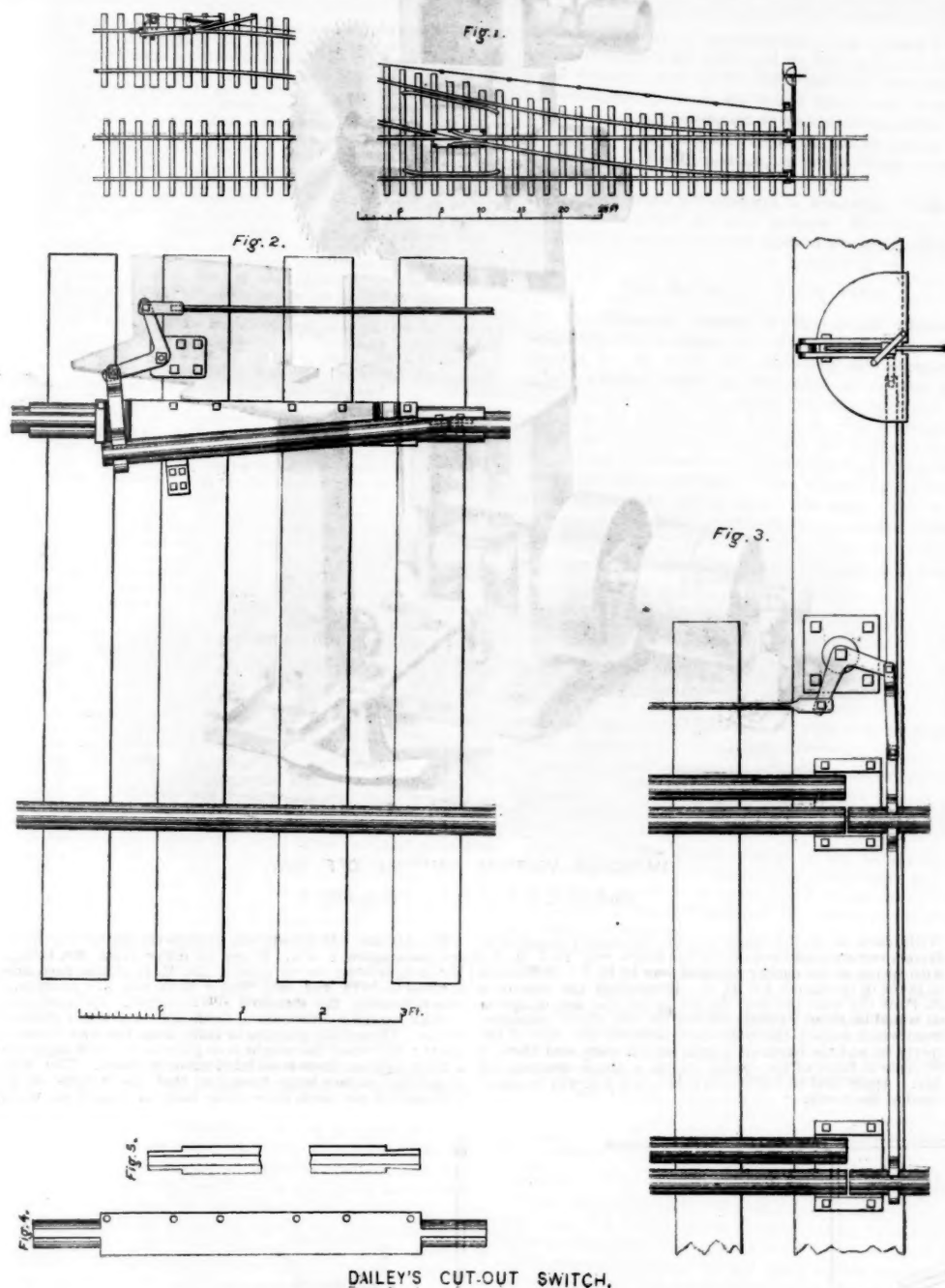
long, each one of which will take on five wagons. The weight of the motor, loaded with its train, is estimated at 346 tons. At the beginning and end of each inclined plane platforms would be built by which the cars could be readily loaded and unloaded to and from this motor. This system it is estimated could be built for 42,780,000 francs, not including right of way, stations and damages. Notwithstanding that the money was secured for carrying out this project, the expert committee rejected it on account of the technical difficulties of operation. In short the commission has rejected all special systems as taking away from the Simplon route its reason for being. The commission unanimously declares that it is only by a tunnel that the passage of the Simplon can be advantageously made. If the financial resources should permit they would prefer a tunnel of 12.5 miles; but they decide that a tunnel 10 miles would give conditions very favorable for operation.

They call attention to the utility of reducing to two or three-tenths per cent. the grades in the interior of tunnels to diminish the deleterious effects of gases of combustion.

The report shows by minute and detailed calculations that a single track tunnel of 10 miles in length will be sufficient for all probable traffic. By giving up to passenger trains 50 per cent. of the time, and by adopting a mean speed of 18  $\frac{1}{2}$  miles for freight trains and allowing hours for 2 various delays, they would calculate to pass 10 freight trains each way through the tunnel in every 24 hours—that is to say, 4,000 tons of merchandise a day, or 1,460,000 tons a year. The total freight tonnage transported through the St. Gothard in 1885 was 425,000 tons.

In view of the facts demonstrated in the tunnels of St. Gothard and of Mt. Cenis, the experts conclude that the natural ventilation of the tunnel would be sufficient,—but even if it were not, smokeless engines could be used without very greatly increasing the cost of operation.

The question of temperature during the construction was the object of special study. The highest temperature encountered in the St. Gothard tunnel would be exceeded for about 7 miles of the length of the 12  $\frac{1}{2}$  mile tunnel; and but about two and one-half miles in the 10 mile tunnel. They estimate that with the great power available at the Simplon, that is to say, 6,000 h. p. at each end of the tunnel, a tunnel could be driven without any special measures to guard against excessive heat; but they suggest that, if necessary, any of the following measures may be adopted: The ventilation of the workings once a week, or even oftener, suspending work in the galleries for that purpose; sprinkling with cold water; the introduction of ice; or, finally, the expansion of the compressed air, suspending work outside of the galleries for a time, which might result in a delay of 15 or 18 months at the most in finishing the work. Summing up this question of difficulties to be met with in the middle of the tunnel on account of the high temperature, the commission concludes that it is possible to overcome them by any one of these means, or the simultaneous employment of two of them if necessary. They are convinced that nearly all of the difficulties met with at St. Gothard would disappear by good organization, and they conclude that the extra cost of the tunnel due to the excessively high temperature will not increase the expense by more than 2,000,000 francs.



DAILEY'S CUT-OUT SWITCH.

The commission recommend for a double track a tunnel 20 ft. by 26.57 ft. (6.1 x 8.1 metres); or, for single track, 21.2 ft. x 13.73 ft. (6.5 x 5.10 metres), and while giving the preference to the former they recognize that the single track tunnel would be a satisfactory solution of the problem.

The line selected by the commission is that proposed by Chief Engineer Meyer, with a tunnel of 16,070 metres (10 miles). This line will leave the line from Viège to Brigue at about 4,300 ft. from the Viège station, at an altitude of 852.65 metres, will cross the valley obliquely and follow the gorge of Saline to the north head of the tunnel. A level of 500 metres should be formed before entering the tunnel for a station, at a height of 820 metres. This approach would have a length of about 9,000 metres, a maximum grade of about 5 per cent and curves of a minimum radius of 300 metres. It presents no great difficulties of construction, except a tunnel of 875 metres.

The altitudes of the tunnel would be 830 metres at the north head, 845.28 metres in the middle and 830 at the south head. On the south side of the tunnel, on the left bank of the Divéria, a short line of 600 metres would connect the tunnel at the Italian frontier with a line coming from Domo.

The estimated cost is 2,414,560 francs for the north approach, 46,924,400 francs for the single-track tunnel, 400,000 francs for the south approach, 300,000 francs for the station ground at the north end, 910,000 francs for 13 locomotives, 2,000,000 francs extra for the special means necessary to meet the difficulties due to the excessive heat, or a total of 52,948,960 for a single-track tunnel, or 62,319,600 for a double-track tunnel. To this sum must be added commissions and interest, whatever they may be.

The commission fixes 6 years as the time necessary for the building of the tunnel, and 7½ years in case the difficulties of temperature require special precautions.

There is some hope that work may be begun before the end of this year; but as much of the necessary subvention is yet unsecured it seems hardly probable that a beginning can be made so soon.

#### The Connecticut Sunday Law.

The Connecticut law concerning Sunday railroad traffic, which goes into effect June 1, and which has heretofore been referred to, has numerous provisions not referred to in the

previous summaries received, and it is, therefore, reproduced below substantially in full.

SECTION 1. No corporation, company or association operating any railroad in this state shall run any train on any road operated by it within this state, between sunrise and sunset on Sunday, except from necessity or mercy; always provided that before ten o'clock in the afternoon it may run trains carrying the United States mail, and such other trains or classes of trains as may be authorized by the railroad commissioners, on application made to them on the ground that the same are required by the public necessity, or for the preservation of freight.

SEC. 2. No such corporation, company or association shall permit the handling, loading or the unloading of freight on any road operated by it, or at any of its depots or stations within this state, between sunrise and sunset on Sunday, except from necessity or mercy.

SEC. 3. Provides for a penalty of \$250 for violation.

SEC. 4. No such corporation, company or association shall transport passengers, on Sunday, upon any train deemed necessary according to the intent of section one of this act, for less than the highest regular fare collected on week-days, and no commutation, special bargain or season or mileage ticket shall include or provide for any travel on said day, under a penalty of \$50 for each violation.

It appears that no daylight trains can be run on Sunday without official permission. As nearly or quite all the Sunday passenger trains, however, are engaged in inter-state traffic it would not be surprising to see the roads take refuge behind the recent court decisions (that state laws cannot be made affecting such traffic), and continue their Sunday trains without observing the formality of asking leave of the Commission.

#### Dailey's Cut-Out Switch.

The engravings herewith show Mr. A. G. Dailey's device for automatically breaking the continuity of one of the rails of a side track whenever the switch is set to the main track. Some kind of a provision against the possibility of cars being blown by wind or maliciously pushed from side tracks out on to the main track is now generally regarded as a necessity, especially where the grade is steep and favorable to such movements, or the track is remote from stations where the cars cannot be closely watched. The obvious objection to the old fashioned log, chained across the rails, or to an ordinary switch with a standard is that careless or hurried men may omit to properly adjust the barrier before leaving it.

With this apparatus he must "block" the track at the same time that he sets the switch for the main track; and there is the additional advantage that he cannot leave his

post until the cars are far enough in on the siding to fully clear the main track. Fig. 1 is a general plan, a part of the track being cut out. Fig. 2 shows the essential portion of the apparatus in detail, the movable rail, about 4 feet long, sliding on a plate, which supports it for its whole length, and which plate is at its ends bent over, as shown in Fig. 4, to form a chair to receive the ends of the main rail. These bent portions are not wide enough to receive the rails in their normal shape, so the latter have their flanges cut off for a short distance, as shown in fig. 5. A short wing rail is spiked to the sleepers for the purpose of guiding the wheel away from the main track after it has been derailed, as will be seen by reference to fig. 1. Other features of the engravings explain themselves. This apparatus is in use on the Michigan Central, and Mr. Dailey's address is Detroit, Mich.

#### New England Railroad Club.

##### AXLE BEARINGS, DUST GUARDS AND LUBRICATION.

The regular meeting of the club was held in Boston, May 11, President Lauder in the chair.

The PRESIDENT: The maintenance of axle bearings and the cost of lubricating material and of applying it constitute a large item of railroad expense, and anything that we can devise to reduce that expense will be a benefit to the railroads and to the public. Hardly anything is more annoying to the traveler than hot boxes, and whether we shall be able to eliminate this evil wholly is questionable; but by careful investigation and inquiry into the usages of the different roads, we may be able to reduce their number. Hot boxes are produced largely from neglect and improper appliances—mainly from neglect. They are attributable to a variety of causes, of which the most frequent, next to want of care, is, perhaps, imperfect dust-guards; imperfect methods of keeping the oil in and the dust out. Excessive wear is almost entirely produced by foreign material, sand, etc., getting into the box. In proof of this I have brought here a Bemis journal and bearing; not for the purpose of advocating the Bemis box, which is a well-known device, but to illustrate how little wear takes place on a journal when the dust is thoroughly excluded from the box. This axle has made 36,000 miles. It is not reduced in diameter to any appreciable extent. This shows that if foreign matter can be thoroughly excluded from the box, there is very little wear; and I think the Bemis box excludes it. A bearing put in after the ordinary manner would have perhaps worn out entirely in that instance. This journal has run on the Cape Division of the Old Colony, one of the worst places in the country for sand. It is the old Bemis journal, 4 in. in diameter. The one that broke in the disaster on the Boston & Albany was only 3¾.

Mr. CHAMBERLAIN: On the Boston & Albany we put on some Bemis axles of 3¾ in. diameter, and after twelve months we found by measuring that there had been no wear at all; they had run 68,000 miles, I believe.

Mr. CONEY: Much of the trouble arising from hot boxes is owing to the poor quality of the oil. A truckman will tell you that anything that is thick and viscid is a good lubricant; but that is a mistake. Paraffine, for instance, is of that nature, but is a poor lubricant. Spermin oil is the best for the purpose; thirty years ago we had nothing else, and then we had little trouble with hot journals, because there was real lubrication, which is not the case with much of the stuff that is now used. If those who purchase oil would take more pains to ascertain its quality, and have some proper mode of testing it, and find out the amount of friction which would result from the use of a certain oil under certain conditions, they would know what they were buying, and there would be less trouble than there is now.

Mr. JOHN W. MORSE (of the S. W. Belknap & Co. Patent Axle Paste and Car Lubricator): A test of our goods was made on the Concord road. Our lubricator was placed on one side of the car, and the oil they had been accustomed to use on the other, their oil costing \$4 to 50 cents per gallon. After a run of 13 weeks it was found they had used of their oil a quantity costing \$3.93, and of our lubricant, a quantity costing \$1.25. Before the experiment the bearings were weighed, and again at the end of the 13 weeks, and it was found there was less wear on our side than on the other; in appearance the axles were not worn any to speak of. Another test was made on the Boston & Lowell, where our lubricant was used on one side of the locomotive and tender and their oil on the other; they ran 13½ months, 100 miles a day, without any of the lubricant being added on our side, or any packing, while on the other side they had to use their oil every two weeks and packing was added several times. I have never learned of a hot box where our lubricant was used. We furnish the goods without cost for a trial with one car. The price is 12½ cents per lb. in small quantities, 10 cents in large. It is a black lead preparation of the consistency of lard.

The PRESIDENT: Many roads use oil that costs less than 12 cents a gallon. I have never been able to make these cheap oils do good service in heavy passenger trains, though they may do for freight cars. We use an oil that costs 23 cents a gallon on our passenger cars.

The trouble with ordinary dust guards is not so much in the looseness around the journal as the space around the guard itself, where it should fit into the cavity provided for it.

Mr. MCKENZIE: Our dust-guards are on all the Boston roads, with two exceptions, but they have not been taken out except on two roads—the Boston & Lowell, and the Boston, Revere Beach & Lynn. The Boston & Lowell took them out after running 70,000 miles, and found them in just as good condition as when they were put in, showing no wear at all, and they were put back, being considered as good as when first put in. Before they were put into the Boston, Revere Beach & Lynn cars, I rasped the raw hide considerably, and when they were taken out, after running 44,000 miles, those rasp marks were still fresh on the raw hide, showing that it had had very little wear; and that road runs in a very sandy place.

Mr. GRIGGS: It is not all dust that causes hot bearings; the trouble is in the construction of the journal and the brass bearing that rubs on it. I have made experiments of a year's duration, and I concluded that the Master Car-Builders' bearing was a costly one to use. It has been a continual source of annoyance; we can carry the same weight with the ordinary 3¼ in. journal, saddle-back box, with less oil and less wear, and we run as heavy cars as anybody. The common saddle-back box, lined with Babbitt metal, will wear longer than the Master Car-Builders' box, either solid or lined. I have also tried the Bemis box for a year with the same success. The wear of the journal and the wear of the brass caused hot boxes all the time. I run mine with common black oil, costing 12 cents a gallon, and never had a hot box.

Mr. CONEY: Mr. Adams tells me that he had some boxes that ran 10 months without any additional oil. Now, we must not lose sight of the fact that oil wears out, and after it has been used a certain time its lubricating qualities are gone. The true principle in running journals is that the two surfaces should not touch each other; the journals should run on the

lubricator. When this is worn out the metal surfaces come together and become heated. A quart of oil in a box would, in less than ten months, cease to be a lubricator, and you might as well run with so much water. Lead-lined bearings are said to be a success, but they must cause a great deal more friction and cause rapid wear. I never found any better box than a composition of 1 lb. tin and 7½ lbs. of copper.

Mr. ADAMS: Suppose there were 4 per cent. more friction; if in the general result the hot boxes were less numerous and your bearings made you less trouble, wouldn't you use the lead line?

Mr. CONEY: Most assuredly; but it is contrary to theory, and also your statement that your boxes ran for 10 months without additional oil. These statements surprise me.

Mr. CHAMBERLAIN: I think the friction between the axle and the lead lining is overestimated; out of some 700 or 800 boxes that I kept the mileage of, the average mileage, when the lead had worn through so as to show the brass, was 33,000 miles. Now, with that short ⅛ in. of lead to run through until the point is reached where the brass shows beneath, I can hardly see where the great friction is between the lead lining and the journal.

Mr. CONEY: Did you take them off after they wore through the lead?

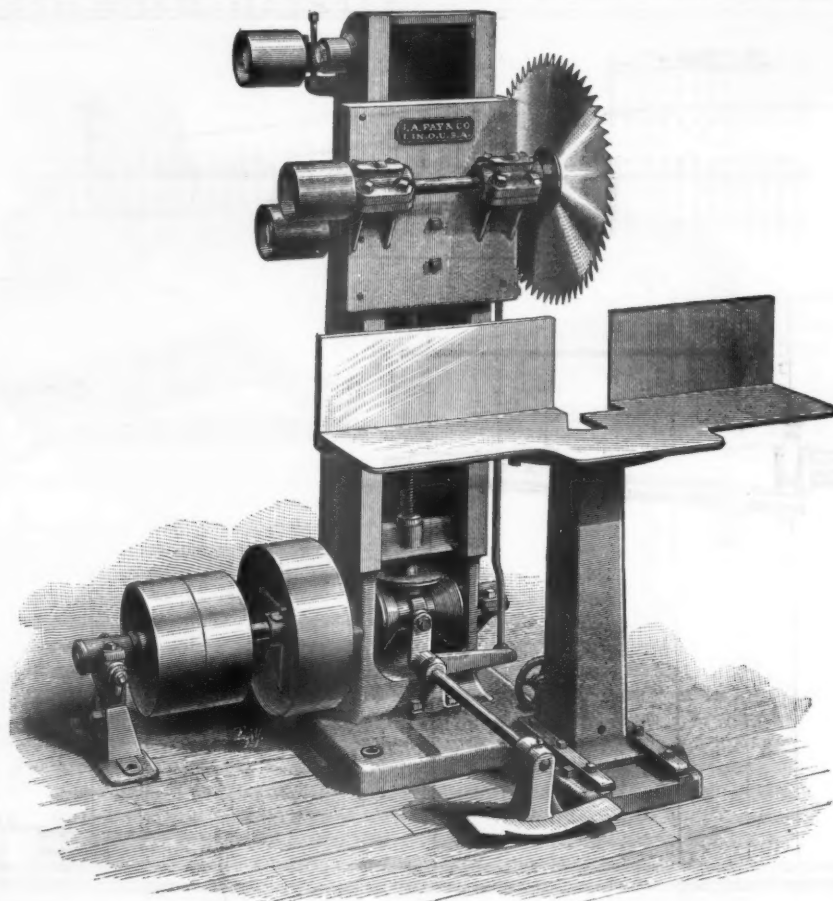
Mr. CHAMBERLAIN: No, sir; they ran up to 70,000 miles; but they had eight or ten times the thickness left after they had run the 33,000 miles.

Mr. GRIGGS: Has it been the practice to run without the lead-lined boxes, under the Master Car Builders' plan? Can you put in a solid bearing and run that?

Mr. CHAMBERLAIN: That has not been the practice with the Boston & Albany, though we have put in bronze solid brass metal and granular metal, and run successfully.

Mr. HILLS: And under engines, too. We have sold and put into use on the Boston & Albany road nearly 15,000 brasses; on the Old Colony, 6,000, and on other Boston roads. They are not lead lined. Under certain circumstances lead lining is good, but we have a metal that has shown the best results. I don't say we never had a hot box. They are putting that metal under every locomotive on the Boston & Albany and on the Boston & Lowell. There is one on the table before you that was put into a cattle car by Mr. Adams in 1884; it has run 2½ years, has made between 70,000 and 75,000 miles, and you see how little it is worn. These granular metal bearings are coming into favor, and we are selling a great many of them. They say this metal absorbs oil, and I suppose it does.

Mr. F. C. Gohring: Lead lined boxes are more heavy on the power, thus causing more expensive repairs than bronze or granular metal. A good granular metal or a good bronze fluxed with phosphorus is the very best anti-friction metal and the best for wear. I tested some oils last week. A 2½-in. journal was used, with an ordinary Babbitt bearing; pressure on the journal 242 lbs. per square inch; total, 6,776; revolutions per minute, 295. The first test was with winter-bleached sperm oil, not very good quality; 60 drops ran 10 minutes, 23,070 ft.; co-efficient with free lubrication, .0059; relative value, .81; efficiency, 100. Heavy mineral ran 10.17 minutes, 23,454 ft.; co-efficient with free lubrication, .0062; relative value, .96; efficiency, .95. No. 2 lard oil ran 9.5 minutes, 21,916 ft.; co-efficient with free lubrication, .0073; relative value, .76; efficiency, .81. Light mineral oil ran 9 minutes, 20,763 ft.; co-efficient with free lubrication, .0071; relative value, .75; efficiency, .83. Black oil ran 8.33 minutes, 19,224 ft.; co-efficient with free lubrication, .0077; relative value, .64; efficiency, .76. The black oil at 12 cents a gallon is very expensive. Of course, these tests are not accurate for railroad purposes, because other elements enter into the matter there, as the jar and excessive pressure on the machinery as the car passes over the ends of the rails. I have some figures here showing the cost of lubrication by sperm oil and black oil, relatively.



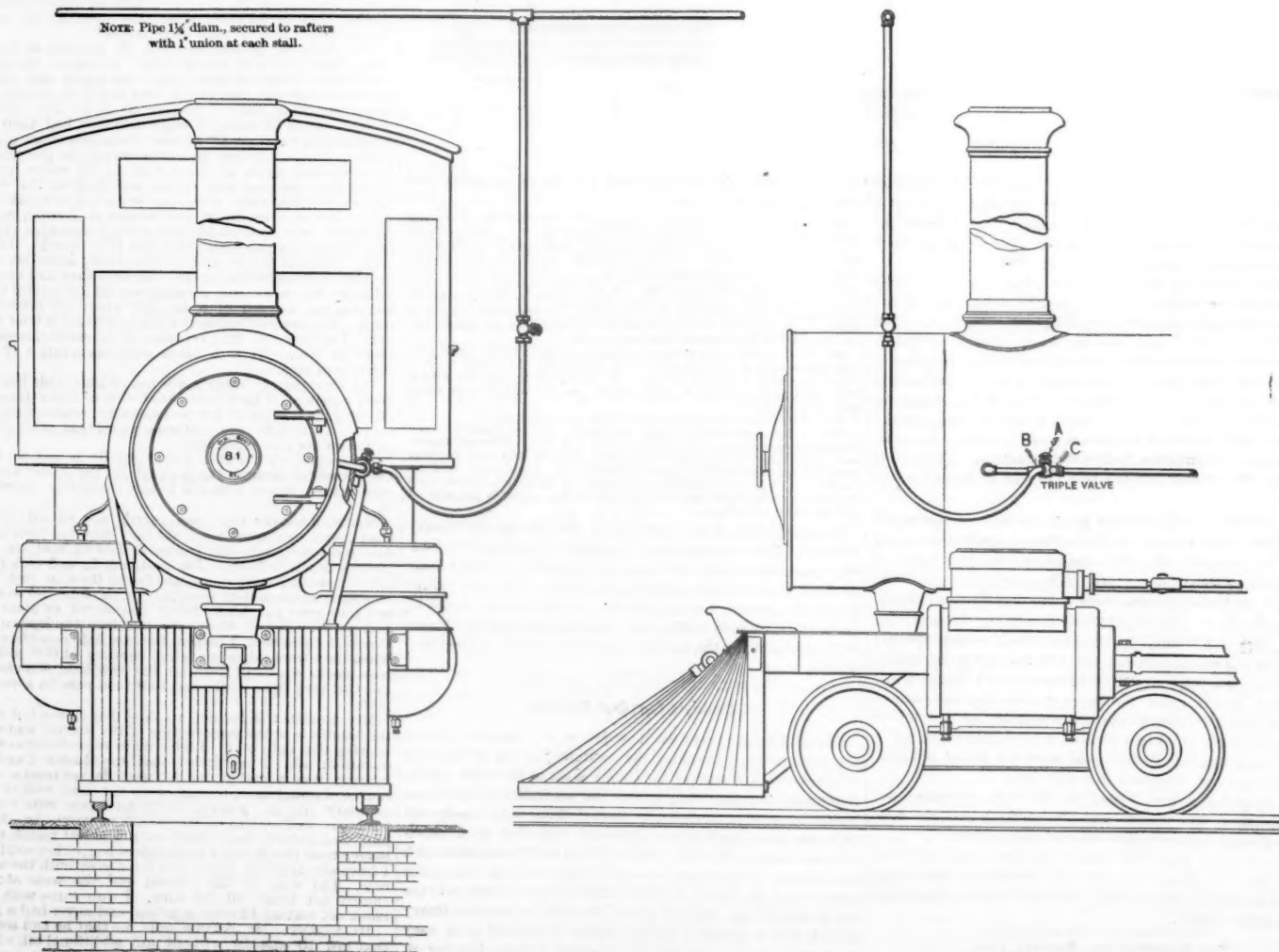
IMPROVED VERTICAL CUTTING OFF SAW.

Made by J. A. FAY & Co., Cincinnati, O.

With black oil, on this single journal, the energy required to drive a certain load for a day of ten hours was 18.3 H. P.; with sperm oil the energy required was 14 H. P. Difference in favor of sperm oil, 4.3 H. P. Estimating the cost of a H. P. at 17½ cents per day, the saving by the use of sperm oil would be about 74 cents per day in the above estimate, from which deduct the difference between the cost of the sperm oil and the black oil, ¼ gal., say 14 cents, and there is 60 cents in favor of the sperm oil on a single bearing per day. Apply that to 1,000 cars a day, and you will be astonished at the result.

Mr. ADAMS: If nobody else defends the Master Car-Builders' Association, I will. I beg to differ from Mr. Griggs. Mr. Adams went on to defend the M. C. B. standard axle, adopted in 1873, and said that if there was any mistake, it was in making the standard size too small. He continued:

With regard to lubrication, fluids are composed of globular atoms. These little globules or balls keep the two surfaces apart; but when the weight is so great as to crush them into a flat condition, there is no lubrication in them. You want to get that surface large enough so that the weight on the journal will not crush those little balls or rollers of which



GREENWADE'S APPARATUS FOR STEAMING LOCOMOTIVES—CINCINNATI, NEW ORLEANS & TEXAS PACIFIC RAILROAD.

the fluid consists. Poor oil makes a poor lubricant, but hot boxes are not caused by poor oil alone. Any mechanical structure that is intended to revolve must be so arranged as to run true. If the parts do not fit each other it will heat every time. I am in favor of the lead-lined brass, because if there is any irregularity in the journal from wear, it will adapt itself to that irregularity, and is not so liable to heat. A journal in the oil box on a railroad car acts like a pump. When it is first put in it is given a little lateral motion of  $\frac{1}{8}$  to  $\frac{1}{4}$  in., and constantly moves in and out, acting like a pump plunger, pumping the oil out, and taking the dust and sand in. When trucks are new, they may be true, but the lumber may be slightly green, and when it dries the bolts may be slightly loosened, the jaw is thrown out of perpendicular, the oil box is thrown a little out of line, and all this produces an imperfection in the bearing and leads to hot boxes. Now to obviate that difficulty Bemis got up his oil-tight and dust-tight box, and so far as that is concerned it is a success; and I say nothing against his box; we abandoned it because it broke down, and we got scared; but he has since changed the plan, and the box may now be abundantly strong. We were convinced it was an absolute necessity to make some kind of a box with a better dust-guard. Our old box has been the laughing stock of scientific men for years; it is an abortion in mechanics. The Bemis box is expensive; there is a large royalty attached to it, and it changes the form of the axle. What is desired is a comparatively cheap box, made quite tight. My mind has run on this a little and I have brought out this box that stands on the table before you. We put it on two about two months ago, with a new pair of paper wheels, and these wheels are now comparatively clean, whereas the wheels on ordinary boxes are very dirty and greasy. We shall test it further. It is simply the Master Car-Builders' journal, just as we have been using, except the back part of the box, and the slide in front; the dust-guards are entirely different. The slide in front is to keep the box against the wheel tight, and we depend partly on the close fit to keep the dirt out. Mr. Lauder requested me to bring this here to-night; perhaps the ideas embodied in it may suggest something better.

We have three coal cars on our road which have run constantly for over three years, with the original packing. We packed 30 stock cars with this lubricant, and they have made two round trips to Chicago and back, and there was not a hot box among them.

[Mr. Adams seems not to have named the lubricant.—Ed.]  
The President: If there is to be any change in axles they should be larger; there are many axles with 4 in. journals. I think the Pennsylvania is now putting in 4x8 journals. That was the size that Mr. Adams and myself and others advocated back in the seventies; we have got to come to it yet. After we began to use the larger wheel, we had no trouble from hot boxes. We now put under as large a wheel as we can and go under a bridge; a wheel with a 33-in. centre, what we call a 36-in. wheel. These, used with the Master Car-Builders' journal, with the granular metal box, do not heat. We have one set of so-called Baker bearings. That bearing has a round disk that bears on the centre, and whatever position your axle box may be in, the bearing on the journal will be uniform; this, with an ordinary standard axle, with a proper dust-guard, ought to wear forever.

Adjourned to the second Wednesday in September.

#### Improved Vertical Cutting Off Saw.

The machine shown in the illustration, made by Messrs. J. A. Fay & Co., of Cincinnati, is designed for special work in car building.

It is built on a heavy column, having a broad sole plate, securing large floor support. The face of the column is planned to receive the saw carriage and arbor, which is gibbed to it, and actuated up and down by a screw of coarse pitch, driven by gearing at the bottom. By pressing the foot upon the treadle, it can be moved up and down to any point that may be desired. The saw arbor is driven from the countershaft at the base, and so belted that the tension of the belt is the same at whatever point on the column the carriage may be placed. The position of the countershaft permits of belting in any direction. The table for the material to rest upon is made independent of the main structure. It is gibbed to the sole plate and has an adjustment to and from the column by means of a hand wheel and screw. The top has a radial adjustment for angle sawing and gaining purposes.

#### Greenwade's Apparatus for Steaming Locomotives.

This apparatus, as shown in the accompanying engraving, has been in use for some time upon the Cincinnati, New Orleans & Texas Pacific. Mr. James Meehan, the Superintendent of Motive Power of that line, informs us that it has given very satisfactory results.

It is designed to enable the water in the boiler of a cold engine to be heated from any engine in steam in the round-house. The saving of fuel is considerable, as it often happens that there is an engine just in, requiring to be blown off. The triple valve and piping shown enables a connection to be made so as to enable steam to pass from one engine to the other. It is a matter of two or three minutes work to connect the two engines, and either heat the cold water by blowing back into the boiler, or get up a good fire, by using it as a blower. It is, however, more frequently used both ways at the same time.

An overhead pipe runs clear round the round-house, with a down pipe between every second stall. Two steam proof rubber hose connections are kept in readiness to make attachments. All the engines have a species of triple valve, by which the connection can be made with another engine.

In an emergency, steam has been raised from cold water, on a 17 x 24 in. passenger engine, in about 20 minutes. In case of shops taking fire, this device would be invaluable, as sufficient pressure to move the engines out could be transmitted from one engine to another.

A very similar device has been used for many years on the Great Eastern Railway (England),\* and was there found to be of great practical value and convenience.

A plain taper plug valve was used, placed on top of the boiler barrel near the smokebox. The valve could be worked by a rod from the cab. The valve being channeled in a peculiar manner, in one position, the valve was closed; in

the second position, a communication was opened between the steam space in the boiler and the blower pipe in the base of the chimney; and in the third position, communication was established between the steam space and a branch, to which a pipe could be coupled to a neighboring engine. The valve on the engine in which steam was to be got up, could be placed in a fourth position, in which steam could pass from the branch to the blower.

Mr. Greenwade's arrangement is somewhat different in detail, but answers the same purpose. We believe the arrangement in use on the Great Eastern was unpatented.

#### The Burlington Brake Tests.

In the following résumé of the result attained at Burlington, the average of all stops is given. Those intended to be made at 20 miles are grouped together, whether made on the level or on the grade, except where expressly stated to the contrary, and the results are corrected for the speed. The stops intended to be made at 30 or 40 miles per hour are similarly treated. This method will enable our readers to form a better idea of the comparative results than a more lengthy reproduction of all the figures obtained in nearly 200 stops. The relative efficiency of the driver brakes is shown by the following figures:

Driver and tender brakes only; train composed of engine and dynamometer car.

Stop in feet, corrected for 20 miles an hour.

Stop in feet, corrected for 40 miles an hour.

Straight air was used in some of these stops by Westinghouse. Carpenter and Eames used electricity.

Driver and tender brakes only; train of 50 empty cars.

Stop in feet, corrected for 20 miles per hour.

Allowing for the greater weight of the Carpenter and Westinghouse trains, this last test shows the Eames and Carpenter driver brakes to be nearly equal to one another and still superior to the Westinghouse, the pistons of which were reported to be leaking.

The average result of the stops made by driver and hand brakes by Carpenter, Westinghouse, and Eames, is as follows: On level, 20 miles per hour, 904 ft.; 40 miles per hour, 3,029. On falling grade of 53 ft., 20 miles per hour, 974 ft.; 40 miles per hour, 3,918 ft.

These results can be compared with following results attained by the same trains with continuous brakes.

	Continuous brakes, 50 empty car trains.		Stops in feet.	
	Applied by electricity.	Air or vacuum.	20 miles.	40 miles.
Carpenter	124	507	239	732
Westinghouse	155	578	342	1,036
Eames	291	690	933	3,900 (7)
Hanscom				

There were no shocks in Carpenter and Westinghouse electric stops. The Eames showed a shock of 12 in. by slidometer and a drawhead was broken, when owing to some defect in electric appliances the brake did not apply on the rear portion. After wards, without any apparent reason, the brake worked well. Shocks with Westinghouse air were very severe. The slidometer moved 71, 103 and 70 in., and two Janney drawbars were broken. The Eames vacuum gave an average slidometer shock of 22 in. The Hanscom gave results only equal to hand brake. The train ran over 4,000 ft. on grade, and was stopped with hand brakes.

Carpenter made on Wednesday the first series of stops with mixed trains, two-thirds of cars loaded to full capacity and one-third empty, with slack couplings; but the slidometer moved only half an inch. Trials show that with quick acting air or vacuum the shocks would be terrific. In these trials the stops were: At 20 miles an hour, 185 ft., and at 40 miles, 903 ft.

The feat of stopping a loose coupled freight train, weighing 1,414 tons, and nearly 2,000 feet long without shock in the length of three passenger cars must be seen to be appreciated.

In three of the stops one car had to be released by hand. In the empty car tests with electricity, Carpenter released in  $1\frac{1}{4}$  seconds, Eames in 10 seconds, Westinghouse in 26 seconds. When released by air Eames was released in 25 seconds, Westinghouse in 28 seconds. All these figures were taken in the rear car.

The Card electric brake was tried on 50 empty car train Wednesday morning, but went on without apparent cause while running, breaking chains, etc., on 6 cars. The train was side-tracked for repairs. The following records as to pressures carried are obtained on engine and in the middle of the train:

	Pressures carried.	
	Train pipe.	Reservoir.
Westinghouse	70 to 80	92 to 107
Carpenter	62 to 75	48 to 57 (cylinder).
Hanscom	25 to 28	
Eames	20½ to 22	14 to 16½ (diaphragm)

The principal results of the breakaway tests were that in three out of four cases the Eames train came together again and coupled. In the fourth stop the cars were five feet apart. The slidometer moved from five-eighths inch to 11 inches. The average time from stop to train starting again was 4 minutes 33 seconds. The Westinghouse cars, when stopped, averaged 16 ft. apart. The slidometer moved 22 to 39 in. Time to start again, 4 minutes 17 seconds. The Carpenter train in one case was separated 8 ft. when topped, and in the other the brakes were released electrically

from the engine, and the front portion pulled 400 ft. clear of the rear portion; no movement of slidometer.

The train fitted with the Card electric brake arrived last week, making five competitors on the ground. The American and Rote brakes are still expected.

#### THE CARD ELECTRIC BRAKE.

The Card electric brake is applied to a train of 50 Cincinnati, Hamilton & Dayton box-cars. Each car weighs about 26,300 lbs., and is of 50,000 lbs. capacity. The passage of a powerful electric current causes a wheel driven from the car axle to engage with a drum which winds up the brake chain. Provision is made for disengaging the drum when the chain is wound up sufficiently tight to apply the proper pressure to the brake-shoes. The wires, which are very stout, are contained in a rubber hose between the cars, and the coupling resembles in appearance that used on the Eames non-automatic vacuum brake. Two storage batteries are employed, one on the engine and one in the caboose. The brake can be applied by either engineer or conductor.

#### WESTINGHOUSE BRAKE-HEAD AND SHOE.

The brake-beam, brake-shoe, etc., used on the Pennsylvania cars fitted with the Westinghouse brake is shown in detail in the *Railroad Gazette* of July 9, 1886. A plain solid shoe is used without any brake head or block. The shoe is prevented from dragging on the wheels by means of a spring composed of one piece of sheet steel riveted to the hanger. The brake-beam is a triangular trussed bar composed of two rolled bars of D or half round section welded together at the ends where they enter the brake-shoe. The whole arrangement is strong and appears likely to be durable and to give excellent results. It was proposed as a standard at the last Master Car Builders' convention.

#### VISITORS.

Among the railroad visitors present during the tests may be mentioned Mr. C. E. Perkins, President; Mr. H. B. Stone, General Manager; Mr. J. D. Besler, General Superintendent, and other officers of the Chicago, Burlington & Quincy; Mr. Robert Miller, Assistant Superintendent and Master Car-Builders, Michigan Central; Mr. R. W. Bushnell, Superintendent Motive Power, and Mr. J. Smith, General Foreman, Burlington, Cedar Rapids & Northern; Mr. E. B. Wall, Superintendent of Motive Power, and Mr. Wells, Pittsburgh, Cincinnati & St. Louis; S. L. Hawks, Air Brake Inspector, Chicago & Alton; George S. Morison, of New York; B. K. Verbryck, Chicago, Rock Island & Pacific; C. J. Ives, Presidents Burlington, Cedar Rapids & Northern; F. G. Darling, Superintendent, Cincinnati & Muskingum Valley; Mr. Potter, Pittsburgh, Fort Wayne & Chicago; Messrs. A. Forsyth, F. Wallis and C. W. Eckerson, Division Master Mechanics, Chicago, Burlington & Quincy, and Mr. Johnston, Division Superintendent of the same road.

#### TECHNICAL.

##### Locomotives for Australia.

An order for forty-four locomotives for Australia is going begging on the Continent. The English agents applied to Austrian works to build them, because the freight from Trieste to Australia would be cheaper than from England, which sounds oddly, considering the frequent and rapid communication between England and Australia. The Austrian works, having nothing to do, would gladly have taken the order under different conditions, which were of the following exacting character: The builders were to find two sureties domiciled in Melbourne for the proper fulfillment of the contract, were to establish workshops there wherein to erect the engines on the arrival of the parts, and were to guarantee that the locomotives made a faultless trial trip of 1,000 miles before the last payment took place. Setting aside the conditions, here is another of those regrettable cases where, if the negotiations had succeeded, English works would have been deprived of orders which undoubtedly should be given to them by all that is fair, considering whence the money to pay for these things originally comes, and now that the high colonial officials are assembled in London, it does seem a favorable opportunity for those specially interested in such like contracts to make an endeavor to get them put upon a more equitable and mutual basis.—*The Engineer*.

##### The St. Gothard Railroad.

The directors of the St. Gothard Railroad have received from the Swiss Federal Council the official communication that Germany, Italy and Switzerland have resolved to grant them a period of ten years for the construction of a second track for the lines Erstfeld-Göschenen and Airolo-Bodno, which measure together 42.26 English miles. The Federal Council gave the further notice that the states mentioned have fixed the guarantee sum required at \$900,000, and that the Gothard Railroad Co. shall only use two-thirds of the interest of their funds. The company had asked the privilege of controlling their entire interests.

##### Germans in the South American Markets.

According to a report of the Secretary of the British Legation at Rio de Janeiro, the Germans are becoming more and more dangerous competitors with the English and the Americans in the market of South America. The following notes are from this report: "Hereto the Germans have only competed with us here in dry goods, but now they are preparing, and not without success, to meet us on a field where we have considered ourselves as masters. Not only has an agent of a German company made an advantageous contract for the delivery of Bessemer steel rails for the Itapemirim Railway, but is negotiating for the furnishing of the necessary locomotives. The railway company preferred to use Baldwin's locomotives (U. S. manufacture), costing about £1,800 each. The German agent offered to supply a locomotive equally as good for £1,150 only, but as the railway management, despite of this, insisted upon having the Baldwin locomotives, the agent offered to let his locomotives run one year without payment, and to take them back if they should prove unsatisfactory." "It is very remarkable," concludes the report, "that among the bidders no English firm was found."

##### Cable Road at Ems.

The double-track cable road from Bad Ems up to the Mählberg will very probably be opened for general use in May. It is the intention to run a car carrying 48 passengers every 10 minutes from each end of the road.

\* See *Recent Locomotives*, page 36, and fig. 161.



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#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new-works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The English Board of Trade report on a collision at Werrington Junction, on the Great Northern, some time since, shows that the conservative British habit which leads to the use of block signals, etc., does not extend to all departments, the accident in question having resulted from the practice of dropping the rear car from passenger trains at way stations without stopping the main portion of the train. This practice, which is somewhat dangerous at best, is doubly so when the train has no automatic brake, or when it has a power brake on a portion of the train and not on the whole. In this instance the rear car had been detached, and was following at about 20 miles an hour, when the forward portion was suddenly stopped, and several passengers were injured by the resulting collision.

With an automatic brake, and the man on the detached car keeping a close watch, he quite likely could stop, under favorable circumstances, as quickly as the forward portion could be stopped; but if he depends wholly upon the hand brake, he is quite sure, sooner or later, to find himself running into something. To let the engineman have free use of a quick acting automatic brake, and have the men on the rear portion depend upon hand-power, is to invite disaster. The running switches by which scores of passenger trains are daily run into the Grand Central Station in New York City involve considerable risk. Whenever a tender brake automatically sets (after the detachment of the engine from the train) as will almost certainly occur in time, it will be fortunate indeed if the engineman happens to be so alert and quick-witted as to put on steam with such good judgment as to get out of the way of the cars.

In his admirable little address to the Brotherhood of Locomotive Firemen, at their union meeting in this city on Sunday last, President Depew, of the New York Central, referred to the popularity of "firing" as a vocation. "When I go out on the road and stop at a station," said he, "the farmers and their boys come down and never want anything else but 'fire.' Of 100 applications for employment which come to me every day, at least 20 are for the position of fireman."

This popularity allows of picking and choosing, but the fine body of young men thus obtained is left too much to chance teaching. The greatest service that can be rendered to them is the fixing of a standard to which they must attain. They are ambitious and anxious to learn, so that it is not uncommon for a young fireman to burn a good deal of midnight oil over his "Catechism of the Locomotive," but they need the stimulus of a prospective examination. They need and often crave real knowledge, and the best of them find it easier to learn from observation than from books. A good lecture on combustion, well illustrated with experiments such as any well taught professor could prepare, would do more for them than much reading. They are a very fine body of men, but that is so much additional argument for giving them a chance to do the

best for themselves, in preparation for the heavy responsibilities which fall on the shoulders of a locomotive runner. This preparation must be more moral than mental, but unless given some kind of intellectual interest in their work, enginemen more easily fall into temptation.

An alert steadiness of mind and body, readiness for emergency of any sort, combined with a contented and easy-going disposition, best serves the locomotive engineer, but to attain this condition life must have its wholesome interests—interests which will set easily on the mind, and not disturb its serenity in those long hours of quiet "looking out ahead," which makes up the major part of his duty.

An honest, hearty interest in the engine as a machine has a moral value to the engineer as great as the merely practical results which it serves in fitting him to deal with any emergency. Let every fireman be required to pass a fair examination before he "graduates," and the engine service will be greatly benefited; but it should be an examination which shall test his judgment more thoroughly than his memory of some words out of a book. The danger of any sort of artificial standard is its failure to measure the everyday working value of the man as a steady-going fellow of good judgment and quiet, energetic disposition.

#### THE BURLINGTON BRAKE TESTS.

The report of the brake trials at Burlington, Ia., are full of interest for all railroad men, also for passengers and for the rest of mankind. Even the animals and provisions are deeply concerned in them.

The progress made in the art of stopping trains since the previous trials is amazing to the ordinary mind, which is always more or less astonished at the results achieved by the skilled mechanic or by the expert inventor. Even the wildest anticipations of the reporters of the daily press have been surpassed. It should be borne in mind, however, by the most sanguine, that these results are possibly somewhat illusory, or even misleading. In fact, the present brake trials must be regarded as only a race between the several systems, to see which can, by any cunning means, stop its train the quickest and with least shock, no matter what the means employed may be. Now, as one or two trials of speed will not determine surely which is the best horse, so these trials may not show which is the best brake for regular use. The tests of endurance and of fitness for actual service come only with prolonged trial under all the varying conditions of use. The Burlington tests, rightly considered, may serve to put some of the competitors out of the race for the present, but they cannot be conclusive. They might well be supplemented by service tests by at once starting the trains which survive for Ogden. Arrangements might readily be made with the Union Pacific for such trials, and a run of 1,300 miles and back, over heavy grades, without constant expert supervision, would go far to decide whether or not the new appliances are yet adapted to the requirements of every day work.

Most of the arrangements by which the surprisingly quick applications of the brakes have been achieved, are in the nature of purely experimental devices. We know that some of them have never been applied in actual work before these experimental trains had started for the trials; so, in considering the action of these devices, we feel much as we do in the circus, when astonished by the athlete, who walks so admirably bottom end up, or by the other who mounts an inclined plane riding upon a sphere:—although surprised, indeed, our cooler reflections lead us to doubt whether these clever performers really have made any decided improvement in the art of progression, which can be permanently adopted by the rest of mankind. On the other hand, it has frequently occurred that what was considered only a scientific toy has been developed or improved by experiment into a really useful mechanism, and we are not without hope that some of the applications of electricity to braking may prove to be reliable and sure in their operation, but for the present they must be looked on as purely experimental.

It is more than ever evident that the main difficulty in applying a continuous brake to a train of 50 cars is not to secure quick action, but to prevent violent shocks in the rear portion of the train. The trials so far have shown conclusively that even the quickest acting atmospheric brake will cause shocks quite inadmissible in ordinary working. The brake is applied to each car in succession, and consequently the front portion has nearly stopped before the brakes have begun to go on the rear portion. The effect on trains of 50 empty freight cars is that drawheads are often broken, and the shocks are extremely violent. In one case, the Westinghouse brake applied by air only to a train of 50 empty cars, fitted

with the Janney coupler, when making a stop at 20 miles per hour, moved the slidometer 103 inches. If an iron weight would slide that distance, the effect on train bands and cattle may be imagined. A load of steel rails would probably slide through the end of the car, and indeed the effect on almost any class of freight would be destructive both to the freight and the cars.

These results are of course obtained with emergency stops, and would be considerably modified by a milder application of the brake. As, however, no shock is felt on the engine, a thoughtless or unskillful engineer can any time, by a full application of the brakes, inflict serious damage at the rear end of his train. It is questionable whether in many cases a mild collision smashing the engine pilot, etc., and doing considerable local damage, would not be preferable to the widespread destruction to stock, valuable freight and cars caused by these shocks.

Two methods of mitigating these shocks have been tried. One is by using tight in place of slack couplings. This appears to be but partially successful when the brake is applied with full force. The shock, as measured by personal sensations, is not quite so sudden, but the slidometer travels about the same distance.

The mischief evidently arises from successive application of the brakes to each car in the train. The Westinghouse brake as used in private trials without the electrical appliance is stated to have gone on in the rear car in 4 seconds after it was applied on the engine. The electric wires in the pipes and couplings, however, appear to have retarded the action, and the brake, when applied by air, now goes on in 7 seconds. At a low speed the train can be stopped in that time, and the effect of the rear cars still running without any retardation upon the solid mass of arrested cars in front is sufficient to explain the collision-like shock experienced in the rear of the train. The most powerful drawsprings used are instantly driven home under the tremendous impact of some 20 rear cars weighing 600,000 lbs. empty, and nothing but the elasticity of the timber in the sills remains to absorb the blow. The fact that all the draw-bars hitherto fractured have been broken in tension shows that the recoil of the drawsprings is also an element which has to be dealt with.

The remedy for shocks appears to have been clearly foreshadowed by the results of the trial of the Park electric brake. The absolutely simultaneous application produced by electricity appears to entirely eliminate shocks, even where loose couplers are used. These results have as yet been only attained by trains entirely composed of empty cars. Whether the same results can be obtained with trains composed of mixed loaded and empty cars will soon be ascertained. The braking power being the same for each car and the momentum varying with the weight of the car, it may be anticipated that the loaded cars will crowd forward and possibly produce some shocks even when the brakes are applied by electricity.

The following table shows roughly the effect of applying the brakes by electricity. Not only are shocks abolished, but the distance in which the train is stopped is considerably reduced. The figures given are calculated for the regular speeds, 20 and 40 miles per hour, an allowance having been made for the actual speeds attained. In the cases of the Carpenter and Eames brakes some further allowance should be made for cars cut out, part of the foundation brake rigging having given way on two of the Illinois Central cars, and a diaphragm having failed on the Eames train. These allowances have not been made in the figures given below, which are, moreover, subject to some possible but slight corrections as regards the speed. The figures given are an average of those obtained on the grade and the level.

The trains were composed of 50 empty freight cars, and a dynamometer car, and the continuous brake was applied to all the wheels in the train except the engine truck, the dynamometer car and one truck of the middle car of the train. This car contains a speed and brake pressure recording apparatus.

In the case of the Eames brake, some failure of the electric apparatus occurred during one of the stops. The brakes went on the front portion of the train, but failed to apply on the rear cars. The distance run was not recorded and this stop has not been included in the average given below.

Distance in which trains of 50 empty freight cars were stopped, Burlington, May 12, 13, 14 and 16, 1887:

Speed, miles per hour.	Electric.		Atmospheric.		Movement of slidometer.	
	ft.	in.	ft.	in.	ft.	in.
Eames.....	247	702	342	1,036	22	22
Westinghouse.....	155	578	230	732	81	81
Carpenter.....	124	507	....	..	..	..

The other brakes have not yet been tried as applied to a train of fifty cars.

There was practically no movement of the slidometer in any case where the brakes were applied electrically.

The effect of electricity in preventing shocks may be further illustrated by the following results, obtained with a train of 50 empty cars:

*Westinghouse brake, service stops, brake applied by air, Janney couplers used.*

Speed miles per hour.	Distance, ft.	Time, seconds.	Movement of slidometer, in.
20	524	24 $\frac{3}{4}$	2
33 $\frac{1}{4}$	1,007	27 $\frac{3}{4}$	11 $\frac{1}{4}$
30 $\frac{1}{4}$	488	21	13 $\frac{3}{4}$
30 $\frac{1}{4}$	1,384	33 $\frac{1}{4}$	14

The two first stops were made on a nearly level grade and two latter on a falling grade of 53 ft. per mile.

It will be observed that the distances in which the train was stopped are more than double the minimum distance given in the preceding table. The shocks (except in the first stop) are, however, still objectionable, exceeding 12 inches.

As a contrast to this, a stop was made with the Westinghouse train, the Janney knuckles being coupled throughout the train by links and pins, a most trying arrangement, especially for the links, many of which were bent and cracked. The brakes being applied by electricity, the following results were obtained:

Speed, miles per hour.	Distance, ft.	Time, seconds.	Movement of slidometer, inches.
21	169	8	2

Comparing this stop with the first given in the preceding table, it will be seen that when applied electrically the train was stopped in less than one-third of the distance obtained when the brakes were applied by air, the shock being in each case the same. It must further be borne in mind that the train was loose coupled when the brakes were applied by electricity, and tight coupled when applied by air. The conclusion that long trains can be handled to the best advantage by electric brakes is irresistible. Whether electrical appliances will remain efficient during thunderstorms and will stand the rough handling of freight service is extremely doubtful, and can only be ascertained by actual service.

It is undoubtedly unfortunate that it was found necessary to prohibit alterations in the apparatus during the trials—an unavoidable prohibition if the trials are to be completed within the limits of time allowed for them—yet it would scarcely be possible for all the conditions of such trials to be anticipated, even by the most experienced railroad men; and if a new idea or modification, suggested by the trials, could be put into use immediately for the subsequent experiments, the present trials might thereby have been rendered of greater value in improving the apparatus than they will now be. Nevertheless they are likely to yield considerable new information which will be useful, when further experiments shall be undertaken, for the purpose of perfecting the apparatus for daily use; and the gentlemen who have organized and are conducting these experiments with so much skill and energy will have the satisfaction of knowing that they have stimulated invention and added to our knowledge.

#### RAILROADS AND RENTS.

The majority of people will judge the Inter-state Commerce law by its fruits. What they want to know is its practical effect upon the business of the country. If this is on the whole bad, they will insist on the repeal or modification of the law; if it is on the whole good, they will uphold it, even though it produces a great many individual cases of hardship which the Commission is powerless to prevent. To nine men out of ten, the effect on general business is the standard by which the law will be judged.

But the tenth man looks at the matter in another light. He considers precedents rather than results. He wishes to know how it will affect the vested rights of the past rather than the business facilities of the future. This way of looking at things is strongest among lawyers and law makers. It prevails to some extent in every legislature; it prevails to a still greater extent in every court. It has led our judges to seek precedents, real or fancied, in the practice with regard to turnpikes or canals, and apply them to points of railroad business where there was no real analogy. They have tried to base rates on cost of service in a way which would utterly fail if brought to the test of practice; and they have persisted in their theory in spite of the fact that no railroad, canal or turnpike of importance ever did or could carry it out. We may expect that they will fall back on the same principles in the interpretation of the Inter-state Commerce law, judging it by its effect on vested rights, rather than its effects on business.

Therefore, when our correspondent asks whether

geographical position is not a vested right, he asks a question which has serious importance to the men who have most to do with the interpretation of the law. He puts into precise shape an idea which is vaguely present in the minds of those who give it no such precision; an idea which lies at the root of a large part of the schemes of railroad regulation.

We propose to examine what would be the effect upon the industrial and social interests of the country if this theory of vested right were consistently carried out. We shall try to show the consequences which would probably arise from any such policy; and we believe that most of those who now accept it as a more or less indefinite axiom would shrink from applying it if those consequences were clearly brought to their attention.

In the first place, if it is consistently carried out, it proves too much. It proves exactly what its supporters would least like. If geographical position is a vested right, this right cannot be based on distance alone, but on all the elements which go to make up natural advantage. Looking at the matter in this light alone, the place which has the benefit of water communication has the benefit of the natural right, as far as there is any such right in the case. "In the element of cost, six miles of ocean are scarcely equal to one mile of land; and estimated by the cost, the distance from New York to San Francisco by water is scarcely as great as from New York to Omaha by rail." If we take all the elements of natural advantage into account, this doctrine of vested rights not merely allows but prescribes those very differences of treatment which its supporters desire to correct. It is only when they arbitrarily select one element—mathematical distance, pure and simple—that their theory proves what they wish.

But, passing by this initial difficulty, let us see what would be the effects of applying the theory of vested rights of situation as they would interpret it. Let us take a specific case which has been decided by the English courts.

The Manchester, Sheffield & Lincolnshire Railway carried coal to tide-water from a group of collieries within a few miles of one another. It charged a common rate for the whole group, regarding the difference of situation as too trifling to make any difference of rates worth while. The Denaby Main Colliery Co., which was nearest to market, complained of this equality as depriving it of its natural advantage of situation. This complaint was upheld by the courts, and the railroad was compelled to make a difference in its charges in favor of the Denaby Main Colliery. Geographical position was treated as a vested right.

Now let us examine the workings of this reduction upon the community. Will it lower the price of coal? It is not at all likely to do so. It is not given to all mines, but only to one which happens to possess a special advantage of situation. It is not likely to develop new sources of supply, but simply to increase the rental value of one of the old sources. It is so much money taken out of the pockets of railroad owners and put into the pockets of a particular set of coal owners.

If the railroad is rich this will probably make little difference to the community at large. But all railroads are not rich. Whenever a new road is built it is a great question whether it will be rich or poor. The community which wants new roads and new facilities is interested in giving its railroads a fair chance to make money. *The way in which a railroad can make money with least inconvenience to the community is by taxing rent.*

We are not supporters of Henry George. We believe that he has exaggerated certain facts and principles in a way which is unsound in theory and would be dangerous if practically carried out. But we also believe that there is a fundamental truth at the basis of his speculations. We believe that he is right in making a sharp distinction between the competitive and the monopolized elements in production. Whatever widens the sphere in which capital and labor can be applied is good not merely for the capitalist and the laborer, but also for the community. It means not only new sources of profit to the producers, but new sources of supply for the consumers. On the other hand, any increase of rent represents no such gain to the community. It rather represents a loss, because it shows that the most available land is limited in quantity, and that the producers must either use worse land or pay a high ground rent.

The lower transportation charges are made, the wider the sphere within which capital and labor can be applied. Wherever new business are built this effect is felt. They develop new businesses and open new sources of supply. But this new business is sometimes so weak that it of itself can little more than pay its share of the operating expenses. Either railroad develop-

ment must suffer, or else the points nearer to market must pay a larger share of the fixed charges. This is charging what the traffic will bear, a policy which, when judiciously applied, means putting the high charges where no great loss of business will follow. Vested interests are taxed for the benefit at once of their weaker competitors and of the general public.

This leveling tendency of railroads is one of the most conspicuous facts of modern industrial history. New sources of food supply have been opened in our Western states, in Russia or in India. Each new development has meant a reduction in the price of wheat and with it a reduction in land values in older states and countries. The gravest social problems of England to-day are connected with the fall in land rents due to the competition of foreign grain. English courts may try to maintain vested rights on a small scale; on a large scale the matter has been taken out of their hands by the movements of the world's trade.

Take a case of a somewhat different kind. The elevated railroads in New York, and similar means of rapid transit in other large cities, have made it possible for men to live further out of town than they formerly could. The effects of this change have been so complicated that it is almost impossible to analyze them in detail, but there are many localities where rents are lower than they would be without these means of rapid transit. What should we say to a landowner who claimed that this was an interference with his vested rights? We should tell him that his little right was not to stand in the way of the growth of a great city, or to prevent the free use of an improvement which meant better air and freer living space to hundreds of thousands of those who used it.

The general tendency of railroad development has been of this character. Railroads have widened the sources of supply and leveled down differences. A recent writer has said that the railroad question has its large side and its little side. The large side of the question is represented by the increased comfort and activity of millions of people. The little side is represented by the occasional cases of real hardship which occur in the process of readjustment. We do not deny that these are bad; but they have been pinned into our ears until a great many people forget that they are only one side, and a smaller one at that.

When railroads were first introduced, an English lord argued bitterly against them. "Is it to be endured," he asked, "that the slumbers of a noble lady in her ancestral mansion should be disturbed by the noise of the locomotive at all hours of the night?" He thought that this was an overwhelming argument; but the modern transportation system was not to be stopped by considerations of this kind. And this is the fate of all arguments which place the vested rights of a few in opposition to public convenience. The English Courts may do so on a small scale; but in America, where the need of new railroads is more imperative, and the landed interest less powerful, the public interest is sure to assert itself in favor of good railroad economy.

There is a special danger at the present time in any effort to enforce the rights of locality. The agitation against private property in land is felt in many quarters, and may become strong on slight provocation. Our chief protection against it is the fact that land values have been leveled, and land ownership distributed, by a great variety of causes, among which railroad development was the most important. As long as our lawmakers insist that railroads shall not create new inequalities any more than they can help, they furnish a safeguard against the agitation; but if they go further, and treat geographical position as a vested right, they undo all their own work. They increase at once the evil possibilities of land ownership, and the force of the agitation against it.

In any wise administration of the long and short-haul clause these facts will be taken into account. The policy of basing rates on cost of service is not the one which serves the public, but the one which serves the men with vested rights and special advantages. It is this which has made it impossible for any state railroad to carry it out consistently. It is not merely bad railroad economy, but bad public economy. The leveling policy which the public interest demands has been on the whole the general policy pursued by the railroads. The worst exceptions to this policy have often reacted severely against the railroads themselves. They have often been made because the railroads could not help it. We cannot better close this article than by a quotation from a letter of Gen. Alexander to a committee of the New York Chamber of Commerce, written nearly seven years ago, but equally pertinent to-day:

The railroads do not make the discriminations or differences themselves, and it is out of their power to entirely remove them. The Creator instituted them when He deter-

mined not to make His creation a dead level of mud and water, and all other material elements stirred up together in uniform solution, inhabited, perhaps, by a single variety of queer fish which would enjoy that sort of premises. And when He gathered the waters together, and raised up the dry land, and gave every large city—according to His own free will and pleasure—either some kind of a harbor or a navigable river, and sometimes both, and left the little towns in the interior without any, then He laid the foundation of every so-called discrimination in freight rates which exists in the United States to-day. \* \* \* The railroads have been able to remove these discriminations to a very great extent. They have given to the interior of the country, even in the most difficult portions, a system of transportation, which is infinitely superior to anything but a water route, and one almost equivalent to that. But because they have been able, partially, to remove natural discriminations, they are unjustly held responsible for those that remain beyond their power to remove, and are represented as willfully and maliciously, and foolishly, being themselves the authors of them.

#### An English Suggestion for the Increase of Net Earnings.

A writer in the April number of the *Edinburgh Review* makes some comments and criticisms on the management of English railroads which are not without interest and suggestion to American managers. He points out the repeated introduction in Parliament of bills for railroad reform, and their uniform failure, and calls attention to the meagre return to shareholders upon the money invested, and to the complaints of excessive and unfair charges and the gradual transfer of manufacture from the coal mines to the shores of the navigable rivers. While the manufacturers find the rates of transportation ruinous, the railroads complain of the niggardly spirit of the shippers who are unwilling to pay a fair price for the service received, and Parliamentary attempts to reconcile those differences are all abortive. Another alarming aspect of the situation on which the writer dwells, is the fact that while returns and capital invested in English lines are diminishing, the continental lines are working toward the cancellation of the investment, and will eventually reach the point where charges will need to be only such as will pay working expenses. In the growing competition for the world's markets, the English manufacturers and traders will be handicapped with heavy interest charges after their European rivals have ceased to pay interest on the cost of the transportation lines. The reviewer finds the root of this evil in the willful neglect of the British managers to ascertain the cost of doing certain kinds of carrying, and their failure to resolutely cut off that which does not pay. His chief argument is based upon the proposition that the highest condition of economical working is when the trains on a line can all be run at uniform speeds with uniform stops at stations. "That the actual working charges of each description of traffic must be increased by any arrangements in consequence of which one train has to wait for another to pass, or to hasten to get out of its way there can be but little doubt. \* \* \* The real source of waste lies in the reduction of the capacity of the line for traffic that is caused by the exigencies of different rates of travel." To approximate to the economical condition the railroads should abandon to the water-ways all that heavy and coarse traffic which cannot pay high rates for high speed, and thus cut off the slowest trains, regarding land and water transport as the essential complements of each other.

In all this there is much truth and sense, but it is that kind of wisdom which in the vulgar United States idiom is known as "hindsight." To say to the poor British shareholder, who has put 800,000,000 sterling into railroads, that he should turn over to the water carriers a part of his traffic, and trust to the evolution of things to build him up a more remunerative traffic in its place, is asking of him an unusual and unwarranted faith in transcendental arithmetic.

For American managers, however, and for the American investing public, there is yet room for foresight. We have but one-fourth the capital invested per mile of road, we have no immediate prospect of close competition with nations served by state railroads, and we may well expect great agricultural and industrial growth in the interior of the continent for years to come. Therefore we are yet in condition to derive great profit from the experience of others. What, then, are the lessons to draw from the Edinburgh reviewer's sermon?

It is as important for us as it is for the Englishman to know the cost of each kind of traffic, and its absolute or its relative profit or loss, and whether or not it can pay in itself or whether it is an indispensable element in making another kind of traffic profitable. It may not always be practicable to abandon an unprofitable traffic, but to be able to prove that it is un-

profitable or barely paying may prevent the building of competing lines, and just now there are signs of another period of unwise and unprofitable railroad building. But it is not hard to find instances of increase in net earnings from cutting off unprofitable traffic. Recent events have turned the attention of shippers more strongly towards the water routes, and it may become more important for the railroads to consider carefully what part of their business they can best afford to abandon and what they will fight hardest to retain.

This leads also to the consideration of the proposition of the reviewer that the greatest economy of working is to be secured when the traffic is uniform. This is perhaps an axiom in railroad economics. But practically every railroad must do both passenger and freight business, and the passenger trains must be run at considerable speed. And that speed will always be greater, probably, than the economical speed for freight trains. Competition for through passenger traffic will fix the maximum passenger speed; cost of fuel and of maintenance of way and machinery will keep the freight train speed as low as possible. Between these maximum and minimum limits there will inevitably be trains running at the speeds determined by their particular functions and conditions. The "limited," the "express," the way, the live-stock, the fast freight and the way freight all have their special reasons for being, and are the results of the needs of business; to reduce them to one, or two, or even three classes according to speed would probably be found impracticable in operation. The proposition of the English reviewer is to run all freight trains at a uniform speed of 30 miles. Were a line worked up to its full capacity that might perhaps pay. It is possible that the saving in wages, cars, sidings and other items might counterbalance the increased cost of operation and maintenance due to the high speed; but that it would cannot be laid down as a general proposition.

#### Improvements in Rolling Stock.

In a recent issue we called attention to some things that have been done, and some which should be done, in the direction of improvement in rolling stock. The various mechanical arguments for the adoption of spring buffers and automatic couplers and brakes may be reinforced by the decisions of the law courts upon the obligation of companies to take advantage of the progress of invention and to adopt and use improvements important to the public safety.

In a Kentucky case which we mentioned March 18, 1881, the action was in behalf of a passenger on the Kentucky Central Railroad, who was killed in consequence of the collision of the train with a drove of cattle which had come upon the track. The ordinary question of negligence on the part of engineer, brakemen, signalmen or other train hands was not raised; no neglect of their duties was imputed. The question of contributory negligence on the part of the passenger was raised, for the company showed in its defense that the passenger was riding in the express car, and that his doing so was contrary to the company's general rule; also that he alone was killed, none of the passenger cars were thrown from the track, and no person riding in them was hurt. But his administratrix, the plaintiff, showed that upon the particular occasion the conductor tacitly assented to his riding in the express car for the time being, and the court held that, under the circumstances, the company could not object.

The question upon which the case really turned was whether the company was bound to provide its cars with the Westinghouse air-brake; for it was clear, under the circumstances, that if those brakes had been provided and had been used, the disaster would have been avoided. Upon this point, the Court said that a railroad company has not discharged its whole duty to passengers when it has provided a road and rolling stock free from defects, and has selected suitable persons to manage the train; but it is bound also to add to these facilities such apparatus and appliances as science and skill shall from time to time make known, and experience shall prove to be valuable in a considerable degree in diminishing the dangers of railroad travel, provided such improvements can be procured at an expense not greater than ought to be incurred to obtain them.

How much expense is the company bound to incur in this respect? Upon this point the law seems vague and indefinite. Probably the question is to be decided by the jury in view of the circumstances proved,—of the capital of the company, and the cost and probable usefulness of the improvements in question. In the Kentucky case the Court said that there was no precise rule; that, upon the one hand, the standard of care and diligence must not be placed so high as to render conveyance by railroad impracticable, and

upon the other, it must not be reduced merely in deference to the alleged want of means of a particular company; in other words, the law would not require a company of small means and business to purchase every appliance or machine which might be found useful enough in diminishing dangers to bring it into general use on lines of heavy traffic. The proofs before the Court showed that the Kentucky Central had, during the year preceding the accident, declared a dividend (rate not stated) on its capital stock of \$5,000,000, and the cost of equipping the entire running stock of the company with Westinghouse brakes would have been about \$12,000 or \$15,000. The Court said that, under circumstances like these, the failure of the company to provide the brakes was a neglect of its duty toward the passengers which rendered it liable in damages for any collision which the brakes, properly used, would have prevented.

Passengers are the persons who have the primary and strongest claim that improved appliances shall be furnished, but employes have a high claim of the same sort. It is true that employes assume part at least of the risk that apparatus which was sufficient and in good order when placed upon the train may become defective from use and wear; and that if couplers, buffers, and similar appliances were, when the running stock was built, of the best known kinds and were well made and in good order, but gradually wore and became defective, to the knowledge of the train hands and without the knowledge of the direction, the hands will not be entitled to recover damages from an injury caused by such defects. But this doctrine does not apply when the advance in mechanical science suggests important improvements, not extravagant in cost, which will protect the lives and safety of the men.

In a case which arose on the Northern Pacific, and which was decided about three years ago, the company employed several gangs of laborers in the construction of the road, each gang having its foreman or boss. The work required that the men should be supplied with giant powder for blasting, and this powder from time to time needed to be thawed. This thawing could be done at an ordinary fire, but that method was very dangerous. There was an improved and safer appliance for the purpose, known as a "heater" or "thawer," being a device by the use of which the danger of explosion might be greatly diminished. The superior safety of the "thawer" was known to the direction, and thawers were provided for some of the gangs, and directions that they should be used were given. But no thawer was provided for the gang in which Gilmore worked, and his foreman adhered to the old plan of thawing before an open fire. The consequence of his doing so was that one day there was an explosion, the foreman was killed and Gilmore was seriously injured. The latter sued for damages, and recovered \$4,500.

The Court held that it was a part of the duty of the company toward its employes to provide the approved and safer plan proper for thawing the frozen powder, and that the neglect of the foreman in this respect was the neglect of the company.

#### Milling and Transportation.

The meeting of the Millers' National Association at St. Louis on the 25th instant will afford an opportunity for criticism of the Inter-state law from the standpoint of this important industry, which is just now very much depressed by causes similar to those which have affected transportation. Milling is suffering from unchecked competition, and not only here but abroad. The flour mills of nearly all countries have a capacity of production greater than the needs of the people for breadstuffs. In England and Scotland, American flour is selling at prices lower than will allow of its manufacture there, and millers are agitating for a protective duty. This, however, they cannot easily obtain, as it is improbable that any political party would risk its popularity by increasing the price of bread for the benefit of a comparatively small number of mills—the provincial millers evidently suffering less than those of the great cities. Of Ireland, however, it is said that not 50 of its 500 mills are in operation.

If, therefore, American millers complain of the new law, they must not forget that their industry is suffering from causes analogous to those which called the act into existence. For all this export business is not profit to them—on the contrary, England is now what New York was in earlier days, the "dumping ground" of American mills. A large amount of exported flour is sold at a loss, because it must be sold, and is manufactured not of choice but by necessity. Our people are dainty in their tastes, and have grown much daintier since the introduction of the new process of milling. The American market takes the "patent" flour, which is only 40 or 50 per cent. of the flour product, and the lower grades are exported and sold for any price they will bring. Moreover, low prices and small profits upon the output have tended to increase production. In order to lessen cost of manufacture per barrel, the output of flour has been increased, until the prices of even "patents" have fallen about to the level of clear, or second grade flour.

Individual interest and sharp competition in an industry requiring a large investment for "plant" will not always produce good results. The individual mill or railroad is at the mercy of the market, but the miller has this advantage, he can "shut down." This the railroad cannot do; it must run and make rates in every market and for every industry.

Railroad competition must in some way be regulated, and, however much the present form of the Inter-state law may be at fault, it is at least one form of regulation.

Let sharp criticism of it be not regardless of its good features. It has made the transportation problem a public question, and placed a responsibility upon "the people," which the people did not before have, and it is important that business men in convention assembled shall recognize this fact. An intelligent public opinion, not mere warm expressions of individual feeling, should now guide legislation, whether it be repeal or amendment of the act. It is plain that whatever it be, the policy by which rates of transportation shall be controlled must now, have, once for all the endorsement of the public's acquiescence, or the danger of injurious legislation will constantly threaten commercial prosperity.

#### Performance of Locomotives.

The locomotive performance sheets of the Atlantic system of the Southern Pacific are remarkably full and detailed, and the following summary and analysis of the results obtained during the month of January, 1887, will be interesting to many of our readers.

Total length of road	1,600 miles.
Number of locomotives, 10 in. cyls.	2
" " 12 " "	4
" " 13 " "	3
" " 14 " "	16
" " 15 " "	16
" " 16 " "	62
" " 17 " "	51
" " 18 " "	43
Total	197

The total monthly mileage is made up as follows:

Passenger	10,811
Freight	286,614
Way switching	77,658
Terminal switching	24,074
Miscellaneous	497,357
Total	497,357

The mileage of the engines is calculated on the following basis:

**Way Switching** is credited only to engines hauling freight and mixed trains when made at stations where no switch engine is stationed.

**Passenger or Freight.**—Actual card distances; also mileage made in doubling grades with trains, except on runs as provided for under head of way switching, where additional is credited.

**Terminal Switching** mileage is based on six miles per hour for actual time in service of regular switching engines; also regular train engines at terminal stations when run by men employed to do such switching or when run by regular train engineers, if they are paid extra for switching.

**Miscellaneous** includes mileage of engines for "waiting orders" when they are under steam, and when engineers are paid for waiting, and not otherwise, mileage made on work trains, mileage made running "light" to and from shops for repairs, and all other mileage not otherwise provided for.

**Helping engines** are credited with actual distance run, and the class of train helped.

Average engine mileage per engine per annum, miles	30,996
Miles run to one pint of oil	14.71
Miles run to one cord of wood	38.92
Miles run to one ton of coal	34.93
Cost of coal per ton	\$5.00
Cost of wood per cord	3.15

The variations in the mileage made per ton of coal are as follows on the different divisions. No pushers are employed:

Division.	Average size of engine cylinders.	Usual type.	Mileage per ton of coal.	Standard freight engine.		Regular train load, No. loaded cars.	Max. grades. Ft. per mile.	REMARKS.
				Size of cylinder.	Weight on drivers. Lbs.			
Morgan's Louisiana & Tex.	14, 15 and 16 in.	American	44	16x24	43,000	44	17.6	Main Line.
Louisiana	15 and 16 in.	"	30	16x24	43,000	25	17.6	Alexandria B'ch.
San Antonio	17 and 18 in.	Moguls and American	34	18x24	47,500	30	52.8	Galveston, H. & San Antonio.
El Paso	17 and 18 in.	Moguls	33	18x24	47,500	20	66.0	G. H. & S. A.
Victoria	15, 16 and 17 in.	American	46	17x24	42,100	18	52.8	M. & P. Extension
						21 and 17	52.8	

Engines with 4 coupled wheels..... 149

" " 6 " "..... 48

Total..... 197

The cost of the month's working was as follows:

Ordinary repairs	2.41
Extraordinary repairs	1.71
Total	4.12
Engineers' wages	6.81
Cleaner's wages	.73
Watering and dispatching	.46
Oil, waste and tallow	.27
Fuel	14.10
Total running expenses	22.37
Total running and repairs	26.49

It appears that an engine was damaged on the road for every 55,000 engine miles run, and one was damaged in the yard for every 166,000 miles run. The cost of repairing each case of damage varied from \$10 to \$200. The engines received general repairs for every 38,240 miles run, but as the cost of each general repair varied from \$103 to \$1,203 per engine during the month, the term "general repairs"

has probably no very strictly defined meaning. The engines appear to have received either "ordinary," or "general" repairs or "repairs after damage" for every 12,130 miles run.

Every engine appears to have received more or less repairs during the month. It might have been thought that out of 197 engines, a few might have got through a month's work without requiring any repairs, but such does not appear to have been the case.

Cost of repairs per engine, one month:

Lowest	\$19
Highest	1,309
Average	104

The cost of repairs is that incurred during the month, and is not the total cost of each repair. For instance, one general repair might cost \$2,000, but only \$800 would be charged one month, and \$1,200 the next.

It is somewhat singular that the consumption of fuel on the Louisiana Division, where only small engines are employed, should exceed that on the El Paso Division, where the grades are longer and the engines larger. A consumption of 75 lbs. per engine mile, amounting practically to about 95 lbs. per train, will seem very high for engines with 15 and 16 in. cylinders.

The fact that the cost of fuel is more than half of the total locomotives is striking and suggestive.

The Albany Journal, reporting an interview with Mr. A. B. Underhill, superintendent of motive power of the Boston & Albany, says that he was the first to apply the steam driver brake to passenger engines, and that his experience with them is highly satisfactory. He says the cost of the apparatus, applied, is \$250, and that of the Westinghouse driver brake \$500.

Since the adoption of the American Brake Co.'s steam-driver brake for passenger engines on the Boston & Albany a number of other roads have followed Mr. Underhill's example, some of them using a large number. With the heavy engines and tenders now used a quite creditable stop can be made with these alone, so that a brake independent of that regularly used for the cars and tender is a valuable additional safeguard; and the fact that "no air-pump, ejector or other intermediate device is required is always a point in favor of steam brakes. They are liked by the men on the engine, because of the quickness with which they can be released; a feature well worth consideration in going on and off turn-tables, backing on to passenger trains, etc., where the brake must often be put on and let off several times in making one stop. It is to be remembered that the prices named by Mr. Underhill cover the complete apparatus, enabling the engineman to apply the brake to any number of vehicles. The expense for air-pump, etc. (included in the \$500), would, on most roads, be charged proportionately to the whole train. Very few roads put the air-brake on any engines, except such as habitually handle passenger (or other) trains fitted with the same brake.

The use of the steam driver brake by roads in the extreme north would seem to indicate that no trouble is experienced from freezing.

Buffalo, with its five or six hundred miles of track, seems to begin to realize that it will be completely crushed by the (grade-crossing monster unless it shall take decisive action to free itself.

The Lumbermen's Exchange of that city has gathered some statistics showing that 6,443 teams and 25,124 persons crossed the railroad crossings on Washington, Michigan and Louisiana streets in one day; and 972 trains crossed these streets during the same time, each train at a low estimate blocking the street one minute at each crossing, making an aggregate blockade of 16 hours 12 minutes. It is estimated that each person and team was detained on an average two min-

utes, showing an aggregate loss to 6,443 teams, equaling 21 days, one hour and 26 minutes, say 21 days at \$3 per day, \$63, or \$20,000 per year of 313 working days; 25,124 persons, aggregating 83 days and seven hours at \$1 per day, \$83.70, or \$37,000 per year of 313 working days, causing a loss to the citizens on these three crossings of \$146.70 daily, or \$58,000 per year. From these figures it is estimated that in the whole city the loss is not less than \$100,000 per year.

The Exchange, at a meeting last week, adopted resolutions calling on the City Council to remedy the evil. It is demanded as a temporary relief that much of the switching across streets be discontinued, and that all trains stop before crossing East Seneca, Louisiana, Michigan and Main streets; but a system of elevated roads is declared to be the only effectual remedy.

Many of the larger railway companies in Great Britain build their own locomotives, and private firms are consequently nearly entirely dependent upon orders from the colonies and foreign countries. It is estimated that about 75 per cent. of the total number of engines built by private firms are exported, and the proportion is increasing, for as

railroads enlarge their works and plant they are able to build as well as repair their locomotives and cars. The London & Northwestern and Great Western are large lines, and naturally build all their locomotives and cars, but the North London, a small line owning only 12 miles of road, have for over 20 years pursued the same practice. The following table, which is partly estimated, shows the extent to which railroads have become manufacturers:

	No. of railroads.	No. locomotives owned.	Av'ge No. owned.
Build all their own locomotives	6	6,074	1,012
Partly dependent on private firms	9	5,763	640
Wholly	80	3,011	43
Total	84	14,848	178

Railroads which build their locomotives in their own shops own 6,074 locomotives, or over  $\frac{2}{3}$  of the total number. Other companies which build many locomotives, but buy occasionally of makers, own 5,763 engines, or barely  $\frac{2}{3}$  of the total number. The companies which practically buy all their engines own the remaining  $\frac{1}{3}$ , 3,011 locomotives.

In a letter this week to J. A. Hanley, Traffic Manager of the Minnesota & Northwestern road, Chairman Cooley has discussed the Inter-state law in the abstract at considerable length, so as to show why, in this individual application for relief from the fourth section of the law, the Commission has thus far refrained from making final judgment. Judge Cooley advances the argument that, as the law is designed for the general good, the fact of certain interests suffering from it is not sufficient reason for its suspension to afford individual relief. The law, he says, specially states that in cases of this kind the grounds on which relief is sought must be peculiar and exceptional, and that where only general reasons operate the law must be left to its ordinary course, however serious may be the consequences in particular cases and to particular roads. So long as a general rule suspending the fourth clause would be clearly in violation of the spirit of the law, the granting of a large number of special orders which would virtually amount to a general suspension would be equally a violation.

While the letter expressly states that it is not a final decision and is only a presentation of certain considerations, it would seem to be a pretty clear indication that most of the temporary suspensions thus far granted will not be extended beyond the dates to which they are limited.

Recent action of the Rapid Transit Commissioners points toward further surrender of the Battery park to the Manhattan Elevated. It is a patriotic duty to protest against any such scheme. The Battery park should be held sacred, and instead of allowing further encroachments upon it, measures should be taken to cause the removal from it as soon as possible of the structures which the elevated has already erected there. The objection to its destruction is not merely sentimental. No man can walk there of a hot summer evening without realizing its value as a breathing place for the poor people living in the lower part of the city. On such an evening the lower side of the park is thronged. Many tired men and women and pale babies get there the invigorating breath of sea air and the soothing glimpse of trees and grass, which but for this little spot they never could get, and it is not too much to say that many lives are saved every summer by these beneficent influences. Only a great public need could justify the destruction of such a spot in a great city, and no such need exists in this case.

The great question at present in the Lake ore trade is that of transportation, competent authorities, according to the *Iron Trade Review*, estimating an output of  $\frac{1}{2}$  million tons from the Gogebic, Menominee, Marquette and Vermillion ranges. The output of these mines, which, as shown in our article of March 4, on the traffic of the St. Mary's Falls Canal, had been between 2 and 3 million tons, increased last year to over 3 $\frac{1}{2}$  million. About 1 $\frac{1}{2}$  million tons of this was shipped for Escanaba; the balance must have afforded about 40 per cent. of the tonnage passing through the government lock, and it is probable, if shipping can be found for it, most of the increased production will take the same route. With grain from Duluth to Buffalo opening at 6c., it is safe to predict a successful year for Lake vessel owners.

The net earnings of 38 roads for the first quarter of this year are summarized by *Bradstreet's*, and show an increase of 23.9 per cent. over the previous year. A comparatively small number of roads report expenses, but the list includes the New York Central, Pennsylvania, Reading, Chicago, Burlington & Quincy, Union Pacific and seven others whose gross receipts for the quarter exceeded a million each, so that it is to a considerable degree representative. The increase in mileage of these roads is only 2.1 per cent., so that the increase in net earnings *per mile* (21.2 per cent.) is nearly as large as that of the absolute amount.

An apparently well-informed officer connected with a prominent road in Connecticut, sends us a communication concerning grade crossings in that state, in which he says that the apparent increase shown in the Hartford *Courant's* table, printed in the *Railroad Gazette* last week, is largely or wholly owing to changes in the method of enumeration. On the road with which this correspondent is connected there has been in the last thirteen years no increase in public crossings though the table in question shows a large one. He says that:

"In the country there are three kinds of roads in use, viz.: (a) Open and legal highways and turnpikes; (b) Private streets and lanes through which the public have right of way only by sufferance of the owner, and under his restrictions; (c) Pent roads and ways; these are abandoned routes in

which the public may travel by assuming all risks, and by closing whatever gates they may pass through.

"Whether any of the recent legislation affects other than the first of the above-named kinds is an unsettled question. The railroads, however, very generally maintain signs and give the whistle signal at all these different kinds.

"In the statistics under the earlier date only the first kind of crossings were numerated, and the increase has been wholly by additions from the other two. I believe that any actual increase of public crossings in this state is almost wholly within rapidly growing villages and cities where overhead or subgrade highways would be generally impracticable.

"Much has been done to increase safety by the putting in of gates and electric signals at the more important or dangerous crossings, as will be seen by the following statistics, which I compile from the last Railroad Commissioners' report:

*State of Connecticut.*

Number of grade crossings	1,247
Of these there are protected with gates or electric signals	123
Number of crossings overhead	151
under the railroad	123

From which it will be seen that of the 1,521 crossings of all kinds, 432, or 28 per cent., are either at separate grade or are guarded; and that of the 1,247 grade crossings, 158, or 12½ per cent., are protected. These figures show that Connecticut's rank is among the highest, if not the highest, in the country."

#### Record of New Railroad Construction.

Information of the laying of track on new railroad lines in 1887 is given in the current number of the *Railroad Gazette* as follows:

*Central Massachusetts*, from Jefferson to Ware, 26 miles. Last reported, 54 miles.

*Gainsville, Henrietta & Western*, to Henrietta, Tex., since last reported, 10 miles.

*Louisville, New Albany & Chicago*, in Orange County, Ind., since last reported, 10 miles.

*St. Louis & San Francisco*, between Fort Smith, Ark., and Paris, Tex., since last reported, about 70 miles.

*St. Paul, Minneapolis & Manitoba*, from Minot, Dak., westward 60 miles.

This is a total of 220 miles for the week, making 1,237 miles reported thus far for the current year. The new track reported to the corresponding date for 16 years has been:

Miles.	Miles.	Miles.	Miles.	Miles.
1887.....1,267	1883.....1,460	1879.....570	1875.....250	
1886.....806	1882.....2,991	1878.....485	1874.....429	
1885.....451	1881.....1,388	1877.....393	1873.....827	
1884.....883	1880.....1,302	1876.....518	1872.....1,305	

This statement covers main track only, second or other additional tracks and sidings not being counted.

#### NEW PUBLICATIONS.

*The New South; Its Resources and Attractions.* By M. B. Hillyard. 9½ in. by 6 in., 413 pages. Index. Manufacturing Record Office, Baltimore, 1887. \$2.50.

*Report on the Internal Commerce of the United States.* By Wm. F. Switzer, Chief of the Bureau of Statistics, Treasury Department. The Commercial, Industrial, Transportation and other Industries of the Southern States. 9½ in. by 6½ in., pages x, c, 11 and 738. Government Printing Office, Washington, 1886.

Both of these books refer to the same general subject, and the one supplements the other in setting forth the wonderful advancement of the South in diversified industries and wealth, and the change in the sentiments of the people, a change which in the words of Gen. J. D. Imboden, the United States Treasury expert for Virginia, "would have rendered the war of 1861-65 an impossibility" if it had commenced before that period.

An outcrop of the feeling which led Randolph of Roanoke to say he would go a mile out of his way to kick a sheep sometimes appears, as where Mr. Hillyard, referring to the fall in the price of corn, says: "It may seem queer to say that this is a blessing, but it effectually prevents the ingress of Western corn." And Mr. Switzer states the present issue in these words: "Shall we longer permit Northern manufacturers, at ruinous drafts upon our depleted exchequers to manufacture our raw materials for us, we transporting them long distances to their mills, and then their fabrics back again to the South, or shall we manufacture them ourselves with the materials at our own doors?"

A decided advance has been made towards doing their own manufacturing. The pig iron made in Southern states in 1880 was 379,310 tons, and in 1886 the make was 875,179 tons, an increase of 131 per cent. In Alabama, Tennessee and Virginia, the increase has been about twice this, or 260 per cent. The capital invested in cotton-seed mills increased from 1880 to 1885, from \$3,504,500 to \$10,792,450, and in cotton factories the increase has been from 9,517 looms and 442,797 spindles in 1880 to 17,873 looms and 285,365 spindles in 1886 in the four states of North and South Carolina, Georgia and Tennessee.

Mr. Hillyard thinks "one of the most gratifying features of the wonderful growth of the iron industries of the South is the wide diversity of new enterprises that are coming into existence for the production of finished iron goods. Machine shops, foundries, rolling mills, stove works, agricultural implement factories and other industries are being established all through the South; thus a home market for southern pig iron is rapidly being developed that will require a very large part of the entire production, even when the new furnaces now under way get into operation." And, "instead of all interests being centered in the establishment of a few big enterprises, the South has realized the importance of the small factory and workshop, and so we see springing up everywhere small factories, requiring but few hands and a little cap-

ital, for producing the many articles of manufacture needed everywhere."

The advantages resulting from the small factory and diversity of new enterprises are probably not over estimated by any citizen of the South and to the railroads they mean increase of local traffic, the want of which the Southern roads have always felt. The Southern states east of the Mississippi have only a mile of railroad to 23 square miles of territory, while the Northern states east of that river have a mile of road to each seven miles of area; to equal that proportion, the South must build 54,000 miles of new road. How much of this will be built in the next five or ten years cannot be predicted, but there can be no doubt that enough will be called for to make it well worth while to centre interest in establishments large enough to keep the greater part of the money necessarily expended for rails and rolling stock where it will do the most good to the section of country making the expenditure. Since 1880, 14,336 miles have been added to the mileage in the South, or nearly 74 per cent.,—a large percentage but not a large yearly additional mileage.

A very healthy agricultural improvement is also recorded, as shown by the breaking up of the large estates into small farms (though the corresponding increase in ownership is left in doubt), and the greater diversity of crops grown and the increase in truck farming, which is now finding a lodgment on the gulf coast, while the farmers of eastern Mississippi propose to supply the Northern markets with grass-fed butter through the winter.

The foreign commerce of the South, particularly of the Gulf states, is as prosperous as it should be. The assertion so attractive to an indolent mind, that a chip thrown into the Mississippi will, by the force of currents, be carried by England and South-eastern Europe, has so possessed the minds of the people that little or no effort has been made for any trade not favored by that current, as is shown by the fact that New Orleans exports merchandise of the value of only \$22,338 to South America; and \$608 to Africa, receiving nothing from Africa, and \$2,900,000 from South America, and all but \$11,500 of this comes from Brazil, to which country she sends nothing. Of her \$91,000,000 foreign commerce 9 per cent. only is imports. The exports of breadstuffs and cotton, amounting to \$76,500,000, goes to Eastern Europe ports, and is greatly paid for through New York. A direct trade with South America would enrich her, and the country tributary, both in the export and import, and it would not necessarily consist of produce at its lowest cost. Instead of exporting only \$18,212 worth of coal, she, with Mobile, should supply all of the West Indies and the Gulf coast.

*Public Debts; An Essay on the Science of Finance.* By Henry C. Adams, Ph. D., of the University of Michigan and Cornell University. Pp. xi. and 407; 8½ by 6 in. Index. D. Appleton & Co.: New York, 1887. \$2.50.

The author defines his purpose to be to portray the principles which underlie the use of public credit. The essay, which "is neither statistical nor historical" (though both statistics and history, when found useful, are employed), is divided into three parts, treating respectively of "Public Borrowing as a Financial Policy," "National Deficit Financing" and "Local Deficit Financing."

Under the sub-heading "Industrial Effects of Public Borrowing," the author says that "the full extent of the assistance rendered by foreign peoples to this government, for which a debt was created, is measured by the gold exports, added to the excess of values imported," i. e., \$525,844,000 and \$339,297,000; adding, "it has since been necessary for the United States, in order to bring home her bonds placed abroad, as also to again gain possession of her portion of the world's gold, to give back capital equal to that received during the war. This was accomplished by causing her exports to exceed her imports."

The case could hardly be stated more succinctly, but as we are just now the only government confronted with the problems of surplus financing, other nations may regret that no notice is taken of the steps by which we caused our exports to exceed our imports, thus bringing home our bonds and regaining our share of the world's gold.

In the chapter on "State Indebtedness Between 1830 and 1850," Mr. Adams points out that, "As in 1830 the Federal Government abandoned the thought of direct control over remunerative public works, giving up the field in favor of local governments, so, during the years from 1842 to 1846, a revulsion of sentiment turned all this business over to individuals. \* \* \* The material advancement of the United States since 1850 no one can nor does one care to deny; yet the industrial, the political and the social influences that have been introduced into national life by the unprecedented growth of corporate power, are the occasion for grave apprehension. \* \* \* A social dependence is being introduced not surpassed in its evil tendencies by any previous form of servitude, politics are being run in the interests of profit to those already gorged with profit. \* \* \* My own opinion is, that it was a mistake for the states to abdicate certain sovereign functions in favor of private corporations, for the evils thus incurred have proved greater than the evils escaped." In consequence of which opinion a larger power to the states, in contradistinction to the general government, is urged; although he fully exhibits and accounts for the inferiority in position of one who assumes public office, without proposing any adequate remedy for this undoubted defect in our government affairs.

The charge that politics are being run, etc., is an old one, but the servants of railroads doubt the effectiveness of the effort, as many of them have a theory that the average legislator is more anxious to find and enact what railroads do not

want than what they think would be to their advantage. The newer charge of social dependence must greatly depend on personal experience and observation, but just at present the industrial dependence of the employees of corporations does not seem to be alarming the general public. The sentence probably would not have been written if the passage of the Inter-state Commerce bill could have been foreseen. Vague denunciations of classes without specification of individuals or individual acts are of no benefit to the country.

From a table on page 305 we learn that the entire bonded debt of states, cities and minor civil divisions for 1880 was \$1,117,821,671, of which about \$186,000,000 was for railroads. At the same time the total capital accounts of our railroads was \$5,108,241,906. Under a State railroad system, if the credit of the states had been maintained, as it was not in all instances, this capital might have been reduced by possibly one-fourth. On the other hand, from the limitations referred to by the author, the state probably would not have secured such efficient service as the corporations, and the cost of construction, if we can judge from the cost of work under the charge of the government, would have been greater, besides which all work would have been more or less a prey to the economical crank, who would never find a gauge too narrow for his views, while the routes would have been located on the log-rolling principles laid down by Secretary Gallatin in his report on internal improvements of 1807, instead of following the lines of least resistance and greatest traffic. It is thought that no one can hold that we would have reached our present position, which may be safely called triumphant, as the cheapest transporters of freight in the world, if our railroads were and had been under the supervision of the different states.

A notice by Dr. Adams of the mania for state superintended and state aided improvements which collapsed so disastrously in 1837, may justify a regret that an account of those enterprises has not yet been written by some one with a view broad enough to see the various influences which "sent our population to grass," and speculation, and sufficient knowledge to compare the projects of that period with the routes of to-day. The great danger is that the task will be undertaken by some one who, commencing with a principle for a starting point, bends all of his endeavors to its elucidation.

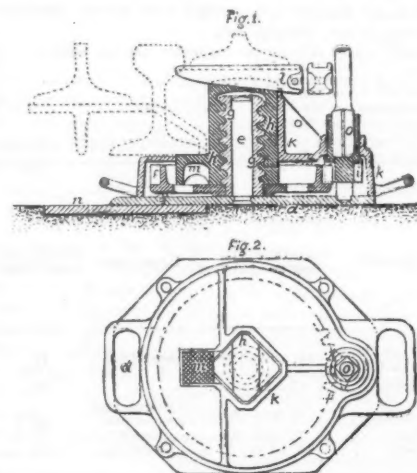
#### Track-Lifting Jack.

The accompanying illustrations represent a German track-lifting jack, which is thus described in *Glaser's Annalen*:

This lifting jack is claimed to possess many substantial advantages, as compared with the devices heretofore used for lifting and supporting defective or broken rails, and it has, therefore, already been largely introduced in railroad service in Germany.

Different methods of construction are shown in the diagrams, figs. 1 and 2. In fig. 1 the steel pin *e* is firmly riveted to the forge-iron plate *d*. On this pin is situated the screw *g*, which is surrounded by the female screw *h*, and which, in connection with the dented (toothed) wheel *f*, can be set in motion by the mechanism *i*, in consequence of which the female screw *h* is raised perpendicularly.

The application of the apparatus is as follows: The shoulder



German Track-Lifting Jack.

on the upper surface of the female screw *h* is brought under the sleeper or rail to be supported, and then the mechanism *i* is turned by means of the square key *o*.

The jack, as shown in the illustration, is capable of a vertical lift of 2½ in.

To avoid loss of power by sinking in soft ballast the plate *n* is placed under the jack, or a wedge is shoved between the screw *h* and the rail, as indicated by the dotted lines in fig. 1.

It can be successfully manipulated by one man, who, in consequence, can attend to the repairing alone. Where the old fashioned lever is used for this purpose, two or three men are necessary to lift and hold in place the rail. The use of the Westmeyer jack, therefore, renders possible a considerable reduction in the working force. As the jack does not yield, the rail is held steadily in proper position, while on account of the unequal power exerted by workmen in the application of the lever, the rail is apt to slip. If the track to be adjusted must be used before the repairs are completed, it is well-known that when using the lever it is necessary to withdraw it, and replace it after the train has passed. With the lifting jack this is unnecessary, as it can be left under the rail, requiring only that the supporting

screw be somewhat loosened. As a further advantage of the jack may be mentioned the small amount of space required on account of the exact perpendicular raising of the rail, whereby the danger of passing trains on double track is considerably diminished.

In Fig. 1 various modes of application of the jack are shown by means of the dotted lines. In all ordinary road superstructure with wooden sleepers the rails are lifted while the screw *h* is either applied so as to press directly under it or the above mentioned wedge *l* can be inserted. With iron cross sleepers the shoulder *m* is placed under the rail so as to support it to the best advantage, as shown by the dotted lines at the left of the fig. 1.

The Westmeyer jack is manufactured in various sizes, the strongest of which weighs 45 lbs., and can be easily carried by one man. In order that one workman may be enabled to repair low joints as well as to support broken rails without further assistance a 30 lb. jack is also made.

#### Economy in Fixing a Maximum Gradient for a Railroad Line.\*

Much has been said and written in regard to the most economical location for a railroad line, i. e., a location in which the sum of annual interest on the capital involved and the operating expenses have a minimum value. Most writers have connected the cost of operating an entire line of railroad with the maximum grade upon it. Engineers have located lines of railroads and parts of lines restricting themselves absolutely to an arbitrary maximum gradient, in accordance with this theory, in such a way as to create a perpetual burden upon the finances of the company.

It is not possible to decide primarily upon the best first cost of a proposed line of railway, for the traffic is in no case a determinate quantity, and hence the gross income can only be approximately estimated. Suppose the cost of a line of railway 20 miles long is \$1,000,000, and the experience of similar lines places the operating expense at one cent per ton-mile, the traffic at two cents per ton-mile and the yearly freightage at 250,000 tons. This line will then pay five per cent. on the first cost annually. Now, whatever change be made in the location, and hence in the first cost, it must proportionately affect the net profit per ton-mile. It is clear that only a certain portion of the operating expense—one cent per ton-mile—can be eliminated by any change in gradient or other detail of location, while the first cost of the line may vary to any extent. Suppose this variation in operating expenses to extend from one-half cent per ton-mile, the expense on the imaginary air line and straight grade, to one and one-half cents on the less costly operable road. If either of these cases is to produce the same return from investment as the first, the cost of the lines will be respectively \$1,500,000 and \$500,000. It is highly probable that the theoretical air line will cost many millions, while it is by no means impossible or indeed improbable that the operable line can be built for \$500,000. It is therefore clear that the greater margin for adjustment will be found on the side of the less costly line. It is also clear that good policy forbids building expensive railroads for succeeding generations. If in the preceding case the road were built for \$3,000,000, and the percentage of return by reason of increased traffic exceed the \$1,000,000 line at the end of twenty-five years by fifty per cent., yet would the latter line be preferable. The former road could probably pay two per cent. return for the first ten years and fifteen per cent. for the remaining fifteen years, while the latter might pay only the estimated five per cent. per annum. People cannot live to-day upon the traffic to be carried next century nor are engineers expected to go upon the principle that they can. Hence a railroad must be built, if at all, in view of the traffic to be transported upon it within a few years of its completion.

Now let us imagine a proposed railroad route or a portion of it to consist of a series of undulations. The line is surveyed, the profile drawn and the engineer in charge is called upon to draw the grade-line in such a way that the road will, in short, pay the largest dividends. It is my purpose to show that a predetermined maximum gradient is a false basis, and that a location founded upon it will fail to conform in almost every case with the above premise of maximum dividends. Suppose a portion of a profile is represented by a line *AB*, and the engineer with his maximum gradient draws the line *AC* and *CB*. Now the volume of a given cut or fill varies almost as the cube of the depth. If *A* and *B* be taken to represent the terminals of the cut, its depth will then vary directly as the gradient or nearly so. Assuming that the operating expenses may vary as the maximum gradient, the engineer will, by an arbitrary assumption, draw a grade-line, which, if in error, affects the cost as its cube.

Again, let us suppose the engineer to vary his so-called maximum gradients and construct a curve of annual expense and a curve of interest on first cost; and then attempt to find an ordinate in which the sum of these two is a minimum. As shown above, the cost may vary as the cube of the gradient; but it is possible that a slight variation may double the actual cost, as on a long incline the whole can be made cut by a very slight change in gradient. The curve of annual expense would be simplicity itself in comparison with this curve of interest on first cost. Indeed, the more values of the gradient used, the more clear would be their total want of connection. There is no wonder practical engineers are loth to attempt such a solution of the problem. It is indisputable that a maximum gradient affects the operating expenses of a road, but its value in respect to both cost of operation and amount of investment is entirely subsidiary to the local circumstances of each case. It is far preferable for the engineer to draw the preliminary profile with as few undulations as possible and avoiding deep cuts; and then search out in the field the shortest and most practicable route.

How frequently the first statement advanced in regard to a proposed railway is the value of the maximum gradient when length, curvature, probable cost and estimated traffic have a chief influence upon the operation and success of the road.

On this account the entire railroad system of Great Britain has been overpaid for. The London & Birmingham Railway, built with a maximum gradient of 1 in 330, or sixteen feet per mile, cost over \$200,000 per mile. Had they not been sustained by the traffic of a wealthy and populous country all of these lines would have suffered bankruptcy. The Union Pacific system, in our own Continent, is a monument of a similar idea. In one section of this road, between two points ten miles apart, and with 840 feet difference of level, a route fourteen miles long and containing 1,900' of curvature was taken, and the straight line four miles shorter and with 600' of curvature less was rejected in order to preserve a maximum gradient of 60 ft. per mile.

The continual lesson of railroad development shows clearly that it is not the ratio of operating expenses to earnings that makes one line a success and the second a failure, but it is the great burden of debt shouldered upon it by the errors of location. It is to be hoped withal, the increased efficiency of

locomotives will bring the reign of King Gradient to a speedy close.

#### THE SCRAP HEAP.

##### A Maine Idyll.

A man in a car on a Maine railroad thought that he felt a bug crawling on his neck and grabbed for it. Then there was a scream, and the man found himself clutching the back hair of a woman who had been sitting behind him with her back to him.

##### Resembles the U. S. Navy.

There is a little railroad running between Hillsboro and Chapel Hill, N. C., a distance of ten miles. It has a president, three vice-presidents, a secretary, an auditor, a general traffic manager, a general freight agent, a general ticket agent, a purchasing agent, a superintendent of motive power and an assistant general manager—13 officers in all. It is said that when the telegraph wire is down the officers string themselves along the road and all messages are passed along by word of mouth.—*Exchange.*

##### The Commission Ought to Advise.

Reporter (to Secretary of the Inter-state Commission)—“Well, how's business?” Secretary—“Very slow to-day.” “How's that?” “Only received two car-loads of protests. Interest must be dying out.”—*Pittsburgh Chronicle.*

##### Railroads in Mexico.

The International, on the northern border, is pushing its line at the rate of a mile per day. The Mexican Central began work on its line from Irapuato to Guadalajara on May 2, and on May 15, it is said, the president of the National road notified the government that work would be started on the gap uniting Saltillo with San Luis Potosi on June 2. This means that work on the southern connection will be abandoned for the present. All the rails for this work came from England.

##### Irish Railroads and Harbors.

Sir James Allport, late General Manager and now Director of the Midland Railway, has been commissioned by the Government to visit the coasts of Ireland to report upon certain proposals for the development of the Irish railroad system and improved harbor accommodation.

##### 1,000-Mile Tickets in Austria.

The Austro-Hungarian State Railroad has just introduced for trial kilometre tickets, after the American style of 1,000-mile tickets. One can buy from the cashier a book which contains a number of checks for 100, 50, 10 and 5 kilometres. The buyer has to paste into the book a photograph of himself for the purpose of identification in case he wishes to change one of the checks for a real ticket. By this system some reduction in the fares has been made possible.

##### Ore Handlers' Strike.

Seven hundred ore handlers at Ashtabula, O., employed on different railroads, struck on May 14 for an increase of 2 cents a ton, about 20 per cent. advance.

##### Her 'Art was True to Bill.

Nannie Hill, of Harman, O., wants to marry her lover, William S. Laville. Nannie's Willie is in prison at Pittsburgh. He is a convicted participant of the lately discovered Panhandle robberies. The connubial scheme is not yet consummated. But if William and his 19-year old fiancée are as persistent as balked lovers usually are, “they may,” as the poetic editor of the N. Y. Sun would observe, “be happy yet, you bet.”

##### Mexican Train Wreckers.

Some Mexicans wrecked a train on the Mexican National, causing the death of the fireman, and within a week three of them were tried, condemned to death and shot. Fortunately train-wrecking is a rare crime on this side of the border, but it is so atrocious that it is to be regretted that it cannot be as swiftly punished as in Mexico.

#### TECHNICAL.

##### Bridge Notes.

The Pittsburgh & Lake Erie will build a bridge over the Mahoning River at Lowellville, ten miles east of Youngstown, O. The bridge will cost \$30,000.

Proposals will be received by George W. Anderson, Commissioner, Taylorsville, Ky., for the erection of a bridge across Brasher's Creek, at Taylorsville, to be of steel, iron or wood, 266 ft. long and 16 ft. roadway, of 3 spans, 2 of 63 ft. each, and the other 140 ft. Stone work furnished. Proposals received till June 1.

##### Manufacturing and Business.

The Laidlaw & Dunn Co., of Cincinnati, O., has bought the entire business and plant of the McGowan Pump Co.

The Abendroth & Root Manufacturing Co., of New York, have taken a contract from the Southern Cotton-Oil Co., for 30 sectional safety boilers to go to New Orleans, Houston, Atlanta, Savannah, Wilmington and Montgomery.

St. Louis capitalists have formed a company for the manufacture of railroad frogs and other iron materials for railroads, and have purchased ground at Randolph, near Kansas City, Mo. Construction of buildings will commence immediately. Capital, \$100,000. Charles H. Talmage, son of A. A. Talmage, General Manager of the Wabash, Western is president of the company.

The Lehigh Valley Creosoting Co. has organized at Perth Amboy, N. J., and leased the Perth Amboy Creosoting Works, built last year by the Lehigh Valley road. The new company will conduct a general lumber and creosoting business. The officers are H. Stanley Goodwin, President; David M. Baird, Secretary and Treasurer; Walter G. Berg, Superintendent.

The St. Louis Car Wheel Works have purchased large tracts of ground about 10 miles from Kansas City, and will build there shops and cottages for workmen. The place has been named Birmingham. The car wheel works will occupy a strip of land 2,500 ft. long by 600 ft. wide.

##### Iron and Steel.

The works of the Patterson Iron Co., at Patterson, N. J., were entirely destroyed by fire on May 12. The loss is estimated at \$150,000.

Six hundred tons of old rails from Liverpool, and 7,690 blooms from Cardiff, Wales, arrived in St. Louis last week for the Tudor Iron Works.

A consolidation has been effected between the Sloss Steel and Iron Co., and the Coalbug Coal and Coke Co. at Birmingham, Ala.

##### The Rail Market.

Steel Rails.—The New York, New Haven & Hartford has bought 3,000 tons of rails, the Detroit, Lansing & Northern 5,000 tons, and the Northern Pacific 6,000 tons. The last report of the Board of Control shows the sales for delivery during 1887 thus far aggregate 1,598,048 tons out of a total

allotment of 1,961,139 tons. Quotations are \$38@39 for standard sections at eastern mills.

Scrap.—Very dull market. Foreign offered at \$20@20.50; yard scrap at \$22@22.50.

Rail Fastenings.—Spikes, 2.40@2.50; angle fish bars, 2.15@2.25; bolts and nuts, 3.10@3.20; bolts and hexagon nuts, 3.25@3.30c.

Old Rails.—Double heads have been offered at \$21.75 in port, and Tees are offered for shipment at \$21.50, with no buyers.

##### Undervaluing Imported Steel.

The U. S. Treasury Department has ordered an investigation at Pittsburgh, Pa., on the charges that there have been undervaluations of steel manufactures. Blooms and billets are specially affected. The cost here of the imported article is \$31.40 a ton, yet it cannot be produced in Pittsburgh for less than \$34. It is said that the Pittsburgh manufacturers of these blooms and billets contemplate the abandonment of the business, which is decidedly unprofitable. These manufacturers claim that importation has been made successful because there have been undervaluations. Pig-iron is also affected. As the demand for it decreases, the importation of the blooms and billets increases.

##### Proposed Bridge at Quebec.

The government engineers of the Province of Quebec have completed designs for an immense cantilever bridge over the St. Lawrence at Quebec. The river is only 2,400 ft. wide but is too deep for piers in the centre. Two granite piers will be built at a distance of 500 ft. and 240 ft. from the shores in about 40 ft. of water, and on these the cantilever ironwork will be erected. The piers will be sufficiently high to allow the masts of the largest ocean steamers to pass under the centre span. The dimensions of the bridge will be as follows: Length of centre (cantilever) span, 1,442 ft.; length of shore spans, 487 ft.; total length of bridge and approaches, 2,460 ft.; height from high-water mark to bottom of bridge, 150 ft.; extreme height of top of cantilever above high water, 408 ft. The centre span will be 290 ft. shorter than the longest spans of the Forth bridge, which are 1,730 ft. each.

##### Work on the Poughkeepsie Bridge.

The fourth and last caisson of the Poughkeepsie bridge over the Hudson River is being sunk, and the construction work is far in advance of the terms of the contract. Work has commenced from the east shore pier.

##### Rack Railroad at Lake Lugano.

There has been formed in Lugano a company to build a rack railroad up Monte Generoso, which is situated on the southern part of Lake Lugano, and affords a magnificent view of the surrounding scenery. It is proposed to build this road on Abt's system, with a gauge of 80 centimetres. It will start from the St. Gothard Railroad station at Capolago and terminate near the highest point of the mountain. Its entire length will be 5.29 English miles, and the total rise about 4,500 ft. The steepest grade to overcome will be 22 per cent., and the radius of the shortest curve will measure 197 ft. The cost of the entire construction and rolling stock is reckoned at \$400,000. It is estimated that this road will carry during the season 25,000 passengers.

##### Steel Rail Making at Chattanooga.

Bessemer steel rails were rolled at Chattanooga on the 7th of this month for the first time. The works will employ 500 men, and have a daily capacity of 250 tons. This new industry in Chattanooga will distribute about \$30,000 per month. Heretofore the most of the Southern pig-iron has been brought north for conversion into useful shapes and then carried back to the point of its production for consumption.

##### The Bethlehem Iron Works.

The Bethlehem Iron Works, on the strength of their \$4,500,000 contract with the government, are putting in a 125 ton hammer, two large hydraulic presses for bending plates and a full set of Whitworth's machinery for compressing steel in its fluid state. This gives us the heaviest hammer in the world; the great Creusot hammer which attracted so much attention at the Paris Exhibition of 1878 weighing only 100 tons. The new works though opening with a government contract, will be a “custom mill.” The Bethlehem works, in common with other users of heavy machinery, had felt the expense and delay consequent on sending to the other side for heavy shafting, and had determined to put themselves in a position to supply the growing demand for such articles whether they secured the government contract or not, expecting enough commercial orders for shafting and heavy steel work to keep them busy.

##### The Sault Ste. Marie Bridge.

The engineers completed their work of laying out the international bridge across the Sault Ste. Marie, Mich., rapids on May 10, and a force of 70 men was at once started on the work. The contract calls for completion by next November.

##### Bridge or Tunnel Across East River.

Mayor Whitney, of Brooklyn, and Mayor Hewitt, of New York, with other officials, met in the New York City Hall last week to hear arguments for and against the proposed bridge or tunnel from Grand street, New York, to Broadway, Brooklyn, Eastern District. On the question of the necessity of the structure the Brooklyn officials voted yea and the New York officials no. It was the opinion of Mayor Hewitt, Corporation Counsel Lacombe, Controller Low and Gen. John Newton that the bridge would be a failure if constructed according to the plans before the Legislature.

##### Suspending Anthracite Production.

One week's suspension of mining in the anthracite regions of Pennsylvania will begin on May 23. This is intended to relieve the excessive stock of coal on hand at tide-water points, which now amounts to 900,000 tons. The Philadelphia & Reading has a stock of nearly 200,000 tons at Port Richmond, Pa.

#### RAILROAD LAW—NOTES OF DECISIONS.

##### Powers, Liabilities and Regulation of Railroads.

In Texas, the Supreme Court decides that a railroad cannot transfer or lease the right to operate its road so as to absolve itself from its duties to the public, without legislative authority; nor will a lease duly authorized by law release the company from liability for a failure to discharge its charter obligations, unless the law giving the power to lease contains also a proviso to that effect. In the Supreme Court of Iowa, it is held that a railroad which has purchased a line of road at a foreclosure sale of an insolvent company, a part of which line was constructed and put into operation with money raised by taxes voted to it by a town, assumes the obligations of the former company, and cannot lease such part of the road to another company, so as to surrender the exclusive use thereof, and by ceasing to operate it, deprive such town of the benefits intended to be derived from such operation, when the aid was voted to the original company.

In the same state it is ruled that a railroad corporation has not the right to fence its track in cities and towns, where it is intersected by streets and alleys, notwithstanding that the language of the statute, requiring fencing where the road

\* From the Journal of the Engineering Society of Lehigh University.

passes through improved land, or where the same person owns the land on both sides of the track, is unqualified.<sup>3</sup>

In Arkansas, a contract under which plaintiff built a railroad for the defendant company provided "that all questions relating to quantity, quality, or manner of construction of the work stipulated to be done shall be decided by the engineer in charge of said work, and his decisions shall be final and conclusive on all matters pertaining to the contract. The engineer made an estimate of the quantity and quality of the work done by plaintiff, and the amount due him therefor. Plaintiff refused to abide by this estimate on the ground that it was wrong and erroneous. The Supreme Court holds that the engineer's estimate is conclusive.<sup>4</sup>

In Iowa, A. entered into a contract with a railway company to convey to it a right of way over his land when the road was located on the land, and the agreed price paid. The Supreme Court holds that the location of the road was a condition precedent; but when the company tendered the consideration, and was ready to perform its part of the agreement, the contract became binding, and A. will be compelled to convey.<sup>5</sup>

The same Court, in another case, decrees specific performance of a contract with a railroad giving it a right of way over certain land.<sup>6</sup>

#### Carriage of Goods and Injuries to Property.

In Missouri, a shipper sued a railroad for failing to provide transportation for his cattle. He testified that he met S., the general freight agent, on May 27, and told him he wanted 23 cars on May 30, 8 at Mound City and 15 at Maitland, for Chicago, and asked him if he could get them ready. S. said he could, and called the clerk to take down the order, and asked plaintiff if he would have the cattle there, and was told he would, and that he wanted the cars on Monday, so he could bed them. S. told him he could have the cars, and to see the agent at Mound City and Maitland, which plaintiff did. The Supreme Court decides this was a contract and the railroad is liable for its breach.<sup>7</sup> In Texas an action against a railroad for refusing to carry the plaintiff's lumber is sustained.<sup>8</sup>

In Tennessee, the Supreme Court rules that a condition in a bill of lading that the liability of a carrier shall cease upon delivery of the goods to the consignee or to a connecting carrier is valid.<sup>9</sup>

In Missouri, the Supreme Court rules that where a railroad company allows a person to hold himself out and act as its general freight agent for a year or more, it will be bound by his contract to furnish cars for transportation of the live stock of a party who deals with him as the agent of the company.<sup>10</sup>

In Mississippi, the Supreme Court holds that a railroad which has a right of way by condemnation proceedings, has a right to make excavations thereon for the purpose of obtaining dirt for surfacing its road-bed; and the company is not liable in damages to an adjacent property owner by reason of the unhealthiness of his plantation, or its supposed unhealthiness from standing water, or the inconvenience of crossing over caused by the pits made in such excavations.<sup>11</sup>

The Mississippi statute forbids railway trains to be run at a greater rate of speed than six miles an hour within the limits of towns, and makes them liable for any injury or damage done while running at a greater rate. The Supreme Court of that state decides that an action to recover for the loss of an animal killed within the limits of a town by a railroad train running at an unlawful rate of speed could be brought in any county through which any part of the line ran.<sup>12</sup>

In Minnesota, the Supreme Court decides that a person may recover from a railroad company the value of his property negligently destroyed by fire from its locomotives, even though he has received from an insurance company its insured value.<sup>13</sup>

#### Injuries to Passengers, Employees and Strangers.

Conductors and brakemen on Kentucky railroads are obliged by Kentucky law to be polite, at least in the case of ladies. But the courts are not so gallant. A female school teacher, riding on a train in that state, was carried past the station at which she desired to stop. The conductor offered to carry her to the next station, or to stop the train for her where it was, three-quarters of a mile beyond her destination. She chose the latter, and subsequently sued the railroad for damages. On the trial she complained that the conductor "seemed very impatient, and his tone was rather rough for a gentleman," that he did not assist her in getting off with her baggage, which consisted of a valise and bundle; and that, as she jumped from the lower step of the platform to the ground, he stood upon the platform, while a brakeman of the train, who was standing by, looked at her and "grinned." The trial court instructed the jury that if they found that the company's servants carried her beyond the station for which she had purchased a ticket, and refused to put her off at her station, and were indecorous or insulting, either in words, tone, or manner, they should find for the plaintiff, and award her damages in their discretion, not exceeding five thousand dollars, the amount claimed in the petition. The chivalric jury gave a verdict for three thousand dollars. But the Court of Appeals has reversed the verdict on the ground that while a railroad must protect its passengers, both male and female, it is not responsible for the "indecorous" conduct of its employees. "This," says the Court, "as defined by Webster, and as commonly understood, means impolite, or a violation of good manners or proper breeding. It is broad enough to cover the slightest departure from the most polished politeness to conduct which is vulgar and insulting. It does not necessarily, or, indeed, generally, involve an insult. The latter assumes superiority, and offends the self-respect of the person to whom it is offered, while the former excites pity or contempt for the one guilty of it. A word or act may be both indecorous and insulting, but yet it often lacks the essential elements of an insult. In the case now under consideration the jury may have believed it was indecorous in the conductor not to stop the train at the platform, or not to carry her valise for her when she was leaving the train, or to let her get off between stations, although she chose to do so rather than suffer inconvenience by being carried to the next station, or in merely telling her that she could walk back to her station; yet none of these things amounted to insult, indignity, oppression, or inhumanity."<sup>14</sup>

In Kentucky the Court of Appeals lays down the legal rule as to the degree of care required of railroads in the carriage of passengers as follows: Railway passenger carriers, in legal contemplation, do not insure the absolute safety of their passengers, but they do bind themselves to exercise the utmost degree of human care, diligence and skill in order to carry their passengers safely. It is meant by this rule (1) that the highest degree of practicable care and diligence should be exercised that is consistent with the mode of transportation adopted; (2) that competent skill should be possessed, which should be exercised in the highest degree. Tested by this rule, for the slightest neglect against which human prudence, diligence or skill can guard, and by which injuries accrue to passengers, the carriers will be liable in damages. This high degree of care, diligence and skill extends not only to the running of passenger trains, with a view to the safety of passengers, but to providing against defects in the road, cars or machinery, or any other thing that can and ought to be done in order to carry passen-

gers safely. Among these duties is that of keeping the track clear of obstructions, and of removing timber and bushes along the track on the land of the company, so as to keep the engineer's view of the track, in running the train, unobstructed. A failure to do this, or any of the duties above mentioned, is negligence.<sup>15</sup>

In Iowa, a passenger, after the train had left the station, called out to the conductor that he wanted to get off there. The conductor, according to the passenger's story, answered "Jump off quick, if you are going to;" but according to another passenger in the car the words were, "Don't try to get off; the train is going too fast." The passenger, however, jumped off and was injured. In a suit against the railroad the Supreme Court holds that the passenger's act was purely voluntary, was not by the orders of the conductor, and that he cannot recover damages.<sup>16</sup>

In Texas the Supreme Court rules that a railroad is not liable for the death of a person who goes upon its track at a place where there is no public crossing, but where he could see an approaching train, and so near to it that an engineer could not avoid running over him.<sup>17</sup> In Iowa, a person injured at a railroad crossing is denied damages on account of his failure to "stop, look and listen."<sup>18</sup>

- <sup>1</sup> Central & M. R. Co. v. Morris, 3 S. W. Rep., 457.
- <sup>2</sup> Stat. v. Central R. Co., 32 N. W. Rep., 409.
- <sup>3</sup> Blanford v. Minneapolis & St. L. R. Co., 32 N. W. Rep., 357.
- <sup>4</sup> Hot Springs R. Co. v. Maher, 3 S. W. Rep., 639.
- <sup>5</sup> Wisconsin I. & N. R. Co. v. Brahab, 32 N. W. Rep., 392.
- <sup>6</sup> Ottumwa, C. F. & St. P. R. Co. v. McWilliams, 32 N. W. Rep., 315.
- <sup>7</sup> Baker v. Kansas City, S. J. & C. R. Co., 3 S. W. Rep., 480.
- <sup>8</sup> Central & M. R. Co. v. Morris, 3 S. W. Rep., 457.
- <sup>9</sup> T. & P. R. Co. v. Rogers, 3 S. W. Rep., 600.
- <sup>10</sup> Baker v. Kansas City, S. J. & C. R. Co., 3 S. W. Rep., 480.
- <sup>11</sup> New Orleans, B. R., V. & M. R. Co. v. Brown, 1 South. Rep., 637.
- <sup>12</sup> Louisville & N. R. Co. v. Saucier, 1 South. Rep., 511.
- <sup>13</sup> Nichols v. Chicago, St. P., M. & O. R. Co., 32 N. W. Rep., 176.
- <sup>14</sup> Louisville & N. R. Co. v. Ballard, 3 S. W. Rep., 531.
- <sup>15</sup> Louisville & N. R. Co. v. Ritter, 3 S. W. Rep., 591.
- <sup>16</sup> Vermont v. Chicago & N. E. R. Co., 32 N. W. Rep., 100.
- <sup>17</sup> Texas & N. O. R. Co. v. Barfield, 3 S. W. Rep., 965.
- <sup>18</sup> Slater v. Burlington, C. R. & N. E. Co., 32 N. W. Rep., 264.

### General Railroad News.

#### MEETINGS AND ANNOUNCEMENTS.

##### Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Fort Worth & Denver City, special meeting, Fort Worth, Tex., June 22.
- Hurlington, Cedar Rapids & Northern, annual meeting, Cedar Rapids, Ia., May 24.
- Cumberland & Piedmont, meeting, Cumberland, Md., June 10.
- Fort Worth & Rio Grande, annual meeting, at the office, Fort Worth, Tex., June 7.
- Minnesota & Northwestern, annual meeting, at the office, St. Paul, Minn., June 8.
- Ogdensburg & Lake Champlain, annual meeting, at the office, Ogdensburg, N. Y., June 15.
- St. Paul & Duluth, annual meeting, at the office, St. Paul, Minn., June 20.
- St. Paul & Sioux City, annual meeting, at the office, St. Paul, Minn., June 4.

##### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Cincinnati, Indianapolis & Chicago, 1½ per cent., payable June 1.

#### Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

- The Master Car-Builders' Club holds its regular meetings at the rooms, No. 113 Liberty street, New York, on the third Thursday in each month.
- The Master Car-Builders' Association holds its annual convention at Minneapolis, Minn., June 14.
- The Western Society of Engineers holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

#### Conductors in Session.

The Grand Division of the Order of Railway Conductors is holding its nineteenth annual session in New Orleans. Twenty-one new divisions have been formed since the last meeting, and 2,386 new members have been added to the order, which now has a total membership of 10,330. An increase of wages and privileges has been obtained during the year on the Missouri Pacific, Southern Pacific, Union Pacific, Chicago & Northwestern, Chicago, Milwaukee & St. Paul, Chicago, Burlington & Quincy, Chicago, Rock Island & Pacific, Chicago & Eastern Illinois, Louisville, New Albany & Chicago, Syracuse, Geneva & Corning, Michigan Central, Alton, Topeka & Santa Fe, New York, Lake Erie & Western, New York Central & Hudson River, East Tennessee, Virginia & Georgia, Burlington & Missouri River and other roads.

The Northern Pacific, Missouri Pacific, Union Pacific, Chicago, Rock Island & Pacific, Chicago & Northwestern and Wash. Railway give members of the order preference in employment and promotion. On Jan. 1, 1886, the pay of freight conductors on the lines where the order is organized, averaged \$73.50 per month. On Jan. 1, 1887, they averaged \$80.10 per month. In the passenger service the pay of passenger conductors on Jan. 1, 1886, was \$92.20 per month; on Jan. 1, 1887, it was \$98 per month.

#### Locomotive Firemen Convene.

The Brotherhood of Locomotive Firemen held a meeting on May 15, in Tammany Hall, New York. Forty-eight branches of the Brotherhood were represented. The object of the meeting was a friendly interchange of views. Addresses were made by Chauncey M. Depew, Mayor Hewitt and Charles A. Dana.

#### The New England Railroad Club.

The New England Railroad Club has adjourned for the summer. Its next meeting will be held on Sept. 14.

#### PERSONAL.

—S. R. Callaway's resignation as General Manager of the Union Pacific was accepted last week.

—Mr. T. J. Potter has left Chicago to assume his duties of General Manager of the Union Pacific at Omaha.

—James Wallace Paramore, a well-known citizen of St. Louis, and a railroad man of some prominence, died on May 18, of pneumonia.

—J. G. Chamberlain has resigned his position as Superintendent of the Cherry Valley Iron Works, of Leetonia, Ohio, to take the management of the Alabama & Tennessee Coal & Iron Company, at Sheffield, Alabama.

—Charles L. Perkins, a well-known iron merchant of New York, died in Paris, on May 17, of pneumonia. His firm was for some years Perkins, Vose & Co., and subsequently Perkins, Livingston, Post & Co. He retired from active business about two years ago.

—H. D. Thompson is the oldest conductor in the employ of the New York, Lake Erie & Western. He began railroading in 1842 on the Ithaca & Owego road. He was then on a train of two platform cars drawn by horses, and a round trip of 58 miles was made in 2 days.

#### ELECTIONS AND APPOINTMENTS.

**Arcadia & Monrovia.**—The directors of this new California road are E. J. Baldwin, San Francisco; E. F. Spence and H. A. Unruh, Los Angeles; W. N. Monroe, Monrovia, and J. F. Falvey, Santa Anita.

**Ashuelot.**—At the annual meeting last week in Keene, N. H., A. B. Harris was elected President and Oscar Edwards, E. F. Lane, John Mulligan, W. H. Haile and G. E. French directors.

**Bozeman & Butte Short Line.**—The incorporators of this Montana company are Chas. H. Cobb, Edwin B. Lamme, John W. Tilton, Theo. J. Lynde, Lester S. Willson, James E. Martin and Thomas Lewis.

**Chicago, Burlington & Quincy.**—At the annual meeting in Chicago the old board of directors was re-elected.

**Cleveland & Canton.**—The following have been elected Eastern directors: W. J. Robels, H. A. Blood, G. N. Smalley, J. R. Bodwell, W. O. Chapman, William Rotch and Albert Van Wagner.

**Colorado Midland.**—R. S. Fitch has been appointed Traffic Manager, with headquarters at Denver.

**Denver Railroad, Land & Coal Co.**—W. B. Parsons, Jr., has been appointed General Manager and Chief Engineer, with headquarters at Denver, Col.

**Detroit, Lansing & Northern.**—At the annual meeting last week the following directors were elected: Alohus Hardy, H. H. Hunnewell, Geo. O. Shattuck, Chas. L. Young, Chas. Merriam, C. F. Adams, N. Thayer, Jas. H. Blake, A. H. Hardy, John A. Burnham and E. V. R. Thayer, all of Boston, Mass.

**Grand Division of the Order of Railroad Conductors.**—At the meeting in New Orleans the following officers have been chosen: C. S. Wheaton, Elmira, N. Y., Grand Chief Conductor; E. B. Coman, Kansas City, Mo., Assistant Grand Chief Conductor; A. B. Garrison, Dennison, Tex., Grand Senior Conductor; C. E. Weisz, Grand Junior Conductor.

**Illinois Central.**—Stuyvesant Fish, of New York, has been chosen President in place of J. C. Clarke, resigned.

**Kansas City Belt.**—The following directors have been elected: G. H. Nettleton, Roswell Miller, J. F. Goddard, E. Wilder, C. W. Smith, W. J. Ferry and Wallace Pratt.

**Kentucky Central.**—The following appointments have been made: C. L. Brown, General Freight Agent; S. F. B. Morse, General Passenger Agent; L. B. Lewis, Jr., Auditor; S. E. Cheeseman, Cashier; Epea Randolph, Chief Engineer; S. R. Tuggle, Master Mechanic; W. B. Jameson, General Baggage Agent. Offices at Covington, Ky.

**Lake Erie & Western.**—The headquarters of the Division Freight Agent, S. B. Sweet, will be removed from Peru to Indianapolis, Ind., on June 1, and will be merged with the Commercial Agency.

T. W. Lee has been appointed General Passenger Agent, with headquarters at Bloomington, Ill., to succeed George W. Smith, resigned.

**Louisville, Evansville & St. Louis.**—At the annual meeting at Mt. Carmel, Ill., last week, the following directors were elected: W. T. Hart, John Goldthwaite, Jacob Edwards, Quincy A. Shaw, Isaac Fenns and N. W. Bumstead of Boston; H. C. Hardin, of Newton, Mass.; J. M. Felter, A. P. Humphrey and St. John Boyle of Louisville, Ky., and T. W. Scott, Fairfield, Ill.

**Manayunk Branch.**—The directors of this new company are: William W. Harding, George Harding, Richard S. Child, Jr., William H. Richards and Franklin Ingram, of Philadelphia, and Henry Burgess, of Ardmore, Pa.

**Michigan Central.**—William J. Seimworth has been appointed Southern Passenger Agent, with headquarters at Toledo, O.

**Minneapolis Terminal.**—The incorporators of the company are: C. S. Goodrich, Charles F. Hatch, S. A. Harris, H. C. Truesdell and C. D. Hammond.

**Missouri, Kansas & Texas.**—At the annual meeting in Parsons, Kan., the following directors were elected: Jay Gould, Sidney Dillon, Russell Sage, George J. Forrest, Samuel Sloan, N. L. McCready, A. L. Hopkins, George J. Gould, William Dowd, R. M. Gallaway, Thomas T. Eckert, of New York; Fred. L. Ames, of Boston; S. H. Clark, of St. Louis; C. H. Pratt, of Humboldt; H. E. Cross, of Emporia; David Kelson, of Parsons, Kan.

**Nashville, Florence & Sheffield.**—This is a consolidation of the Nashville & Florence and the Tennessee & Alabama railroads. The officers are: M. H. Smith, President; J. E. R. Carpenter, Vice-President; T. S. Eastwood, Secretary; W. W. Thompson, Treasurer. The directors are M. H. Smith, J. H. Ellis, J. E. R. Carpenter, William Parks, H. W. Bruce, C. Quarrier, A. M. Quarrier.

**New York & Boston Express Line.**—George A. Morton, late General Baggage Agent of the Boston & Albany, has been appointed Superintendent in place of W. E. Lyon, deceased. The business of the line is chiefly the supervision of the joint sleeping and drawing-room car service over the New York, New Haven & Hartford and the Boston & Albany.

**New York & Harlem.**—The stockholders have re-elected the old board of directors.

**New York & Sea Beach.**—Theodore Driscoll has been appointed General Ticket Agent.

**New York, Susquehanna & Western.**—The old board was re-elected at the annual meeting last week.

**Northern Pacific.**—President Cleveland has appointed Byron L. Smith, of Chicago, a commissioner to examine a portion of this road in place of J. W. Doane, resigned.

**Pasadena, Ramona & Long Beach.**—The incorporators of this new California company are: J. DeBarth Shorb, of San Gabriel; H. N. Rast, of Pasadena; J. W. Hellman, Llewellyn Bixby and A. E. Pomeroy, of Los Angeles.

**Philadelphia & Reading.**—George S. Allen, heretofore Master Mechanic at Tamaqua, is appointed Master Mechanic of Mahanoy Division, and of the shops on the line from Fort

Clinton to Newberry Junction, including those at Tamaqua, Mahanoy Plane, Gordon and Shamokin. The headquarters of Frank Hinkley, Division Road Foreman of Engleides of Mahanoy Division, acting also as Road Foreman of Cattawissa Division, are established at Mahanoy Plane. John J. Whalen, in addition to his duty as Road Foreman of Engines, Main Line Division, will be Acting Master Mechanic, with headquarters at Reading.

John H. Rankin has been promoted to the position of Master Car-Builder, with charge of all the company's shops.

Richmond & Danville.—C. M. Crump has been appointed Auditor, with office at Richmond, Va.

St. Louis, Fort Scott & Wichita.—Thomas F. Fisher has been appointed Assistant General Freight and Passenger Agent, with office at Wichita, Kan.

Sault Ste. Marie & Northwestern.—This is the new name of the Fairchild & Mississippi of Wisconsin. At the annual meeting last week the following officers were elected: President, N. C. Foster, of Fairchild; Vice-President, S. W. McCaslin, Eau Claire, Wis.; Secretary, C. M. Wilson; Treasurer, G. A. Foster.

Shingle Springs & Placerville.—The directors of this new California company are: Leland Stanford, C. F. Crocker, Timothy Hopkins, Charles E. Green, W. E. Brown.

Sioux Falls & Fort Dodge.—The incorporators of this new company are George R. Pearson, of Rock Rapids, Ia.; John Q. Adams, Spencer, Ia.; John F. Duncombe and M. Duncombe, Ft. Dodge, Ia., and R. F. Pettigrew, Sioux Falls, Dak.

Tennessee Central & Alabama.—The incorporators of this Tennessee company are Horace Scott, W. T. Glasgow, S. Hill, W. L. Granberry, James L. Gaines, R. Z. Taylor, T. J. Hoppel.

Utah Central.—The following officers have been elected: Charles Francis Adams, President; John Sharp, Vice-President. Directors: Henry McFarland, Fred. L. Ames, Sidney Dillon, Horace S. Eldridge, Feramorz Little, P. P. Shelby and Harry Hill.

Wilkesbarre & Western.—J. I. Higbie will have charge of construction on this road, T. S. Morehead having resigned the position of Chief Engineer. H. E. Richter, Assistant Engineer, has charge of the Engineer Corps.

Wilmington & Northern.—F. B. Hibbard has been appointed General Freight and Passenger Agent, vice L. A. Bower, resigned.

Windsor & Forest.—At the meeting in Keene, N. H., last week, the following officers were elected: James Burnap, President; Virgil C. Gilman, Hosea W. Parker, Otis F. R. Waite, Christopher Robb, Daniel C. Linsley, John A. Spaulding, James S. Taft, Charles W. Holt, Directors; Otis F. R. Waite, Clerk; Virgil C. Gilman, Treasurer.

#### OLD AND NEW ROADS

Alabama Midland.—The company has contracted with the Alabama Terminal and Improvement Co. for the construction of its proposed road from Montgomery, Ala., to Bainbridge or Chattahoochee, as may hereafter be decided.

Arcadia & Monrovia.—Articles of incorporation filed in California. The proposed road will be of standard gauge, running from Arcadia to Monrovia, 3 miles.

Atchison, Topeka & Santa Fe.—The Chicago extension of this road is expected to be completed between the first and middle of next September. At present the work of grading all along the line from Kansas City, Mo., to Fort Madison, Ia., is going forward. Tracklaying from Kansas City will be commenced about July 1. It is said that the road is being constructed with little consideration for local traffic, but as directly as possible for an air line. The crossings with other roads will be either above or below grade.

The statement is made that the company will build a line along the California coast from Los Angeles to San Francisco, notwithstanding the announcement that an agreement had been made with the Southern Pacific that the Atchison would not build north of Mojave. It is stated that the new line will be 60 miles shorter than the Southern Pacific route.

Baker City & Granite.—This company has been incorporated in Oregon.

Baltimore & Ohio.—At the monthly meeting last week a resolution was adopted that the lease of the Winchester & Strasburg road should not be renewed unless it can be done at 4 per cent. on the capital stock. The expiring lease requires the company to pay 7 per cent. on the \$650,000 stock, and guarantees the Baltimore & Ohio the right to a renewal of the lease for 20 years. The road is 20 miles long and forms a portion of the valley branch. The Baltimore & Ohio owns a majority of the stock and will likely secure a renewal of the lease upon the desired terms.

President Garrett has secured from the stockholders, an extension of the 60 days option, given him in March. He is to pay them \$5, and the May dividend, and the option lasts 65 days longer.

President Garrett has given testimony before a commissioner this week in a case against the Baltimore & Ohio which has been pending for two years. It is on behalf of the holders of 25 shares or less of the stock of the Pittsburgh & Connellsville Railroad Co. The bill of complaint recites that the Baltimore & Ohio has not properly used the \$10,000,000 borrowed for the development of its Pittsburgh division. It is said that President Garrett declined to give answers to questions as to whether any of the loan had been used on the Philadelphia extension.

Boston & Providence.—The company has petitioned the Railroad Commissioner for leave to change the location of the highway at the Bussey Bridge, so that the new bridge can be built at a less acute angle.

Bozeman & Butte Short Line.—Incorporated in Montana to build a road from Bozeman to Red Bluff, to Butte and various other points.

Buffalo, New York & Philadelphia.—R. C. Dale, Samuel Dickson and E. W. Sheldon, representing the plaintiff in the various foreclosure suits of this company, obtained decrees of foreclosure in the Circuit Court at Pittsburgh, Pa., last week.

Central Massachusetts.—Rapid progress is being made on the extension of this road from Jefferson, Mass., through to the Connecticut River. The rails were laid into Ware, 26 miles from Jefferson and 72 from Boston, on May 13, and the first through train to that place will be run this week, although regular trains will not be put on till June 15. It is expected to finish the road through to Holyoke, 28 miles from Ware, by Aug. 1.

Central Missouri.—Engineers are making surveys at the site of the proposed bridge above the city of St. Charles, Mo., over the Missouri River.

Chicago, Milwaukee & St. Paul.—The company has sent out engineers to survey a line to the Gogebic iron range, in Northern Wisconsin.

Chicago & Northwestern.—The Albion extension is completed from Genoa to Albion, in Boone County, Neb. Tracklaying will be continued to Oakdale, 25 miles north.

Cincinnati, New Orleans & Texas Pacific.—The Supreme Court of Ohio has given decision in suits instituted by the state against this company and against the Cincinnati Southern. The cases are alike. The petitions charged these companies with conspiracy with the Standard Oil Co. to build up the latter as a monopoly by acts of unlawful discrimination in rates on petroleum, these discriminations amounting in some instances to 243 per cent. in favor of the Standard Oil Co. The proceedings brought are in quo warranto, and are for a forfeiture of the charters of the railroad companies. The companies interposed demurrers, which the Supreme Court has overruled, thus settling that such acts are abuses of corporation franchise which may be punished by a forfeiture of the charters, if the evidence sustains the charges.

Cincinnati & Suburban Elevated.—A company has been incorporated to build an elevated railroad in Cincinnati. Capital stock, \$5,000,000.

Cleveland & Canton.—The shops and offices of this company will be removed from Canton to Cleveland, O. At a special meeting of the stockholders last week it was voted to place a mortgage on the company's property and to issue bonds, the proceeds to be used for changing the gauge of the road and making other improvements. There was no opposition.

Cleveland & Mahoning Valley.—The question of double tracking this road from Cleveland to Youngstown, O., is now under consideration by the directors of the New York, Pennsylvania & Ohio, which company leases the road. The English interests in the New York, Pennsylvania & Ohio are very strong, and therefore the matter has been referred to their representative in London. The outlook for the proposed improvement is promising, and it is expected that the proper authority for making the change will be given in the course of a few weeks. If so, the work will be immediately taken up and completed during the present year.

Columbus, Hocking Valley and Toledo.—The Hocking Valley railroad litigation, several times delayed, was begun in Columbus, O., on May 13. President Shaw made a deposition and said that when he took the road last January he found no stock of the Columbus & Hocking Coal & Railroad Co. This is the stock for which, it is alleged, the Cleveland syndicate gave themselves \$8,000,000 Columbus, Hocking Valley & Toledo 5 per cent. bonds. Other depositions showed that the coal stock was formally transferred to the railroad on the records. Others showed that the bonds and stock of the railroad had been used as collateral in 1881 to secure a loan of \$6,000,000 made by Stevenson Burke and his friends when they bought the stock of the three lines, which they consolidated into the Hocking Valley system. Judge Burke appears in the suit as the leading counsel for himself and his side. Ex-Governor Hoadley took up the case for the plaintiffs on May 17. He denounced the machinations of Burke and his friends as "the most gigantic fraud ever perpetrated in the state of Ohio." The arguments in the case will continue for several days.

Cumberland, Moorefield & Southwest Virginia.—The survey for this road was begun on May 19. The proposed line is from Moorefield in Hardy County, to Cumberland, Md., via Frankfort.

Dallas & Oak Cliff.—Charter filed in Texas for a road from Dallas to a point on or near Fort Worth. Capital stock, \$400,000.

Danville & La Grange.—The contract for grading, bridging and tracklaying on this Tennessee road has been given to F. W. Ferguson & Co., who have commenced work with 300 men and 100 teams.

Denver, South Park & Pacific.—The first mortgage bondholders held a meeting in New York this week. The report of the committee was approved and foreclosure proceedings will be begun immediately to recover possession of the property from the Union Pacific, which owns the stock and operates the road. Default in the payment of interest on the first mortgage bonds was made on the first of the month.

Detroit, Lansing & Northern.—Vice-President Muliken, in his annual report, says that a survey has recently been made for a line between Grand Ledge and Grand Rapids, Mich., 53 miles. The building of the road is strongly recommended.

Duluth & Iron Range.—The stock and bonds of this company, with the title to 20,000 acres of land in Minnesota, will be turned over on June 5 to a syndicate composed of H. H. Porter, of the Pullman Palace Car Co.; J. C. Morse, of the Union Steel Co. of Chicago; Marshall Field, of Chicago; D. O. Mills, of New York; J. D. Rockefeller, of the Standard Oil Co., and others. The securities, which include \$500,000 of capital stock and \$1,750,000 of mortgage bonds, and also deeds to iron ore deposits near Vermilion Lake, are now being deposited with the Fidelity Trust Co., with whom the formal transfer will be made. Charlemagne Tower, who sells the road, will receive checks amounting to over \$6,000,000.

Duluth, Pierre & Black Hills.—The company has organized in Pierre, Dak.

Duluth, South Shore & Atlantic.—The company will build a hotel at Marquette, Mich., at an expense of \$150,000.

Georgia Southern & Florida.—Proposals will be received by the Macon Construction Co., which will organize on June 4, for the grading, cross-ties and trestling on all the roadbed of this road between Macon and Valdosta, Ga., that has not been previously done or contracted for. The contracts will be let June 6. Address Jeff Lane, Macon, Ga. Five hundred men to work on the road are wanted immediately.

Helena, Boulder Valley & Butte.—Grading is completed from Jefferson to Boulder, Montana. The three tunnels on the line are finished, and nothing now remains to do but the completion of the trestle bridges. Tracklaying is now in progress.

Houston & Texas Central.—C. P. Huntington and representatives of the second and general mortgage bondholders of this company have agreed to discontinue foreclosure proceedings. The road will be taken out of the Receiver's hands, where it has been since February, 1885. The Southern Pacific, which holds a greater part of the stock, will control the property.

Indianapolis, Decatur & Springfield.—It is stated that the company is preparing to extend the road from Decatur west to Springfield, Ill., thence to Petersburg and

Beardstown to connect with the eastern extension of the Atchison, Topeka & Santa Fe. Receiver Hammond is now conferring with a committee of Decatur citizens for right of way through one of the principal streets of the city, without which no move can be made.

Kansas City & Independence Short Line.—Articles of incorporation have been filed in Missouri. The company propose to construct a standard gauge road from Kansas City to Independence, 12 miles. Capital stock, \$100,000.

Kentucky Central.—The purchasers of this property have assumed control and have begun to operate the road.

Kentucky Union.—The Court of Claims has ordered an election in Fayette County, Ky., on the adoption of the proposition to give \$200,000 to this company. If the western terminus is Lexington, it is proposed that the county give \$50,000 and the city \$150,000.

Kingston & Pembroke.—An iron mining company has been organized at Kingston, Ont., to develop the mines on the line of this road. The company is controlled by New Yorkers. Samuel Thomas, R. P. Flower and H. R. Bishop are stockholders.

Lawrence, Emporia & Southwestern.—Charter filed in Kansas. The company intends to build what is known as the Carbondale line from Kansas City to Emporia, Eldorado and other points in the southwest of Kansas, and also a branch from a point 5 miles from Lawrence, on the Carbondale road, to Quenemo, on the Missouri Pacific, in Osage County, Kan., and thence to Winfield, in Cowley County.

Long Island.—Work was begun this week on the extension from Hammill's Station, Rockaway Beach, to Far Rockaway, a distance of 4 miles.

Louisiana & Arkansas.—The Chief Engineer of the company is now making a survey between Alexandria, La., and Brinkley, Ark.

Louisville, New Albany & Chicago.—This company has added 20 miles to its road, having opened a branch from Orleans to French Lick and West Baden Springs, Ind.

Manayunk Branch.—The company has obtained a charter in Pennsylvania. The proposed road will extend from a point on the Schuylkill Valley road, near Manayunk, Philadelphia County, to Wissahickon Creek, 4 miles. Capital stock, \$100,000.

Manhattan.—The report of the Manhattan Elevated for the quarter ending March 31, is as follows:

	1887.	1886.	Inc. or Dec.	P. c.
Earnings .....	\$1,947,790	\$1,760,096	I. \$181,694	10.3
Expenses .....	1,170,020	934,769	I. 235,251	25.1
Net earnings.....	\$777,770	\$825,327	D. \$47,557	6.4
Other income ..	17,250	20,985	D. 3,735	17.7
Total.....	\$795,020	\$846,312	D. \$51,292	6.7
Charges .....	505,794	455,870	I. 49,924	10.9
Net income.....	\$289,226	\$390,442	D. \$101,216	27.4

During the corresponding quarter last year the fare on the elevated roads was 10 cents.

Maricopa & Phoenix.—It is expected to have the road finished by June 1, between Maricopa and Phoenix, Ariz., about 26 miles. The building of a station at Phoenix has been ordered.

Memphis, Kansas & Western.—The company proposes to build from Cherryvale, Kan., to Neosho, Mo., via Chetopa and Baxter Springs, Kan. The company hopes then to build westward from Memphis, Tenn., to Neosho.

Milwaukee & Northern.—Grading is nearly completed on the extension from Iron Mountain to Republic, and tracklaying will begin shortly. The distance is about 40 miles, and trains are expected to be running by Oct. 1.

Minneapolis Terminal.—Articles of incorporation filed in Minnesota. The company will make connections with all railroads entering the city, and also accommodate any new manufacturing near the city desiring track connections. Capital stock, \$1,000,000.

Missouri, Kansas & Nebraska.—The engineering corps has started out on the survey of the line between Lawrence and Paola, Kan. The road will ultimately reach from Rich Hill, Mo., to Hiawatha, Kan.

Missouri Pacific.—In addition to the purchase of land in St. Louis for Missouri Pacific headquarters made last week, land has been bought on the corner of Sixth and Chestnut streets, in St. Louis, where a seven-story building will be erected to be used as the central offices of the Pacific Express Co.

The company has assumed control of the Gainesville, Henrietta & Western road, which is now operating from Gainesville to Henrietta, Tex., 70 miles.

Mobile & Ohio.—It is stated that the company has obtained control of the charter of the Birmingham & Northwestern, and that a survey between Corinth, Miss., and Birmingham, Ala., will be made at once.

Nevada & California.—The company is extending its line from Moran, Cal., to Hot Springs in Lassen County. Six miles are now graded, and permanent locations are completed. The extension will be about 57 miles long.

New Haven & Derby.—The Board of Finance of New Haven, Conn., has decided to report adversely upon the proposition of the New York & New England to buy the city's interest in the above named road for \$175,000. The offer of \$250,000 from J. B. Sargent, a manufacturer, was also rejected. The result is that the city of New Haven will continue to control the New Haven & Derby.

New Roads.—A road is now being surveyed from Valley Falls, R. I., to Walpole, Mass., about 20 miles, there to connect with the New York & New England. The surveys are thought to be in the interest of the New York & New England.

New York Central & Hudson River.—The new time-table of this road establishes a line of sleeping cars between New York and Hamilton, Ont. The train leaves New York at 6 p. m. and Toronto at 12:20 p. m.

New York Elevated.—The Rapid Transit Commission in New York decided last week upon routes for additional elevated roads in the city. The first one runs from South Ferry, up South street to Market slip and through Market to Division street. The second and third routes extend from Battery Place to West street, to Duane street, to Greenwich street, to connect with the Ninth avenue line, and from West through Clarkson street, to Carmine street, to the Sixth avenue line at Amity street and Sixth avenue. The fourth commences at Battery Place, runs through Battery Place and Battery Park, so as to connect the three lines named above.

New York, New Haven & Hartford.—The directors have authorized President Clark to lease for 99 years the New Canaan road, extending from Stamford to New

Canaan, Conn., 8½ miles, and the New Haven & Northampton, from New Haven, Conn., to Conway Junction, Mass., 95 miles, with branches and leased lines, making a total mileage of 173 miles. The lease of the first road is to be at 4 per cent., and the other on a graduated scale, beginning at 1 per cent. and reaching 4 per cent. in 10 years. These proposed leases must now be ratified by the stockholders. Both the roads are already controlled by ownership of a majority of the stock.

It has been decided to put in additional block signals between New York and New Haven.

**Pacific.**—During the sessions of the Pacific Railroad Commission in New York the past week, G. P. Morisini, Russell Sage, Washington E. Connor and Jay Gould have appeared in town, and given testimony at considerable length, as far as they could remember.

The Commission has sent out a circular containing 58 questions, these questions covering all those matters into which Congress directed inquiry. The circulars were sent to the leading business men along the line of the land grant roads, and the leading shippers of the country, asking all persons in possession of information to communicate it to the Commission.

**Pasadena, Ramona & Long Beach.**—Incorporated in California. The company proposes to build a road from Pasadena, Cal., via the Monterey Pass, to a point on the Pacific coast at or near Long Beach; estimated length, 25 miles. Capital stock, \$500,000. Office, Los Angeles, Cal.

**Pennsylvania.**—It is said that the company has made an arrangement with the Norfolk & Western by which the latter will secure entrance to all parts of the Pennsylvania system.

**Philadelphia & Northeastern.**—The Councils Committee on Railroads in Philadelphia met this week to consider the bill providing for the construction of an elevated road by this company on Front and other streets from Jenkintown to League Island, with branches to Frankford and Tacony. It was decided that at an early day the committee should visit New York and Boston to examine the different kinds of elevated roads.

**Philadelphia & Reading.**—It is said that the floating of the new 4 per cent. loan will not be attempted until fall. According to the plan the general bonds are to be paid in cash, principal and interest, on or before July 1, 1888, or in case they are not paid off the holders shall receive 48 per cent. in new first preference bonds for the sixes, and 50 per cent. for the sevens as a bonus and in lieu of back interest. On July 1, 1887, there will be due 18 per cent. interest on the sixes and 21 per cent. interest on the sevens. To pay off the general \$9,500,000 will be required. Then about \$2,000,000 will be needed to retire the general mortgage scrip, about \$2,100,000 to pay off mortgages on real estate owned by the company, and about \$2,000,000 to repay Drexel & Co. for interest paid on the general mortgage reorganization certificates.

The Schuylkill Navigation Co., in its suit for unpaid rental against this company, has obtained a judgment for \$868,583, covering rental prior to Jan. 1, 1887, with interest from that date. The judgment holds good only against the corporation and becomes an unsecured claim if the corporation is foreclosed. To reorganize the company without foreclosure it will be necessary to make some settlement with the Schuylkill Navigation Co.

It is thought that the extension of the Philadelphia & Newtown road by this company is to be made from Newtown, Bucks County, Pa., to a point near Somerville, N. J., a few miles south of Bound Brook.

**Rome, Watertown & Ogdensburg.**—A decision has been given denying an injunction to restrain the Executive Board of Rochester, N. Y., from removing the tracks of this road from the streets of the city. The Court decides that the tracks were laid on Sunday to elude an injunction and that the necessary permission to lay them has not been obtained.

**St. Joseph Terminal.**—This company undertook to lay tracks across those of the Kansas City, St. Joseph & Council Bluffs in St. Joseph, Mo., this week, but the latter company put 500 men at work to prevent it.

**St. Louis, Arkansas & Texas.**—The company is under contract to complete its branch to Sherman, Tex., by July. From some point on the line a branch will be built to Fort Worth, either through Dallas or near it. The line from Lewisville to Shreveport in Louisiana will be in operation next March. Another line is to be built from Altheimer to Little Rock, Ark. This will complete the 350 miles under contract.

**St. Louis & San Francisco.**—Tracklaying between Fort Smith, Ark., and Paris, Tex., was finished on May 10.

**St. Paul, Minneapolis & Manitoba.**—Track is laid 60 miles west of Minot, Dak., and is being put down at the rate of 4 miles a day.

**Sault Ste. Marie & Northwestern.**—The Fairchild & Mississippi Railway Co. has assumed the above name. At a meeting last week it was decided to begin tracklaying on the 15 miles now graded, and to open the road from Fairchild to Osseo, Wis., on July 1. A meeting is to be soon held in Chicago to arrange for a loan of \$2,500,000. The capital stock has been increased to \$3,500,000.

**Shingle Springs & Placerville.**—Articles of incorporation have been filed in California. The company will operate a standard gauge road in El Dorado County, from Shingle Springs to Placerville. Estimated length of road, 12 miles. Capital stock, \$500,000.

**Southern Pacific.**—Vice-President Crocker is quoted as saying that it is not yet decided whether his company will foreclose the mortgage on the Oregon & California road or take up the old bonds and issue new ones guaranteed by the Southern Pacific. It is probable that the latter company will not take formal possession of the Oregon & California until connection is made with it on the California end. A transfer of securities, however, will be made before then.

This company's branch, which is building through San Buenaventura County, Cal., has crossed the Ventura River, and tracklaying goes rapidly forward.

**Springfield, Shelbyville & Mount Carmel.**—This road is being surveyed through the southern part of Macon County, Ill.

**Temiscamingue.**—The Rev. Father Gendreau, of Montreal, who is President of this Canadian road, has instructed the Engineer, P. C. C. Dumas, to survey a line from the termination of the road to the Kippawa Lake, 8 miles. The construction work will immediately follow.

**Tennessee Central & Alabama.**—Incorporated in Tennessee. Proposed road is from Trenton, Tenn., to Florence, Ala., and from Trenton, north to the Mississippi River.

**Toledo, St. Louis & Kansas City.**—The change to standard gauge on this road is progressing, new bridges are building, and contracts are being let for new rolling stock.

**Wabash Railway.**—Receiver McNulta has arranged to pay the coupons on first mortgage bonds from the surplus now in his hands, in accordance with Judge Gresham's recent order. They will be paid in New York on June 1.

**Warrior Coal Fields.**—The company has recently contracted for 6,000 tons of steel rails, and is now ready to begin building the road, which will extend from Meridian, Miss., to Decatur, Ala.

**Winfield & Wichita.**—The company has sold its franchise to P. L. D. Latham & Co., the contractors who built the Bluff City Branch of the St. Louis & San Francisco road. The engineer corps started last week. From Winfield to Wichita, Kan., is about 40 miles.

**Wisconsin Central.**—Several hundred men are working day and night on the extension of this road near Penokee, Wis., along the top of the iron range to Hawley, and the extension is expected to be open in July.

## TRAFFIC AND EARNINGS.

### Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Month of April:	1887.	1886.	Inc. or Dec.	P. c.
Atch. T. & S. F.	\$1,673,020	\$1,281,470	I. \$391,550	30.5
Bur. C. R. & N.	235,216	209,100	I. 26,116	12.4
California South.	131,865	60,505	I. 71,360	117.9
Cape F. & Y. V.	18,205	16,079	I. 2,126	13.2
Central Iowa.	90,838	95,003	D. 4,165	4.9
Ches. & Ohio.	337,953	317,162	I. 20,791	6.5
Eliz. L. & B. S.	72,133	65,743	I. 6,390	9.7
Ches. O. & S. W.	124,431	124,371	I. 60	0.0
Chi. Mil. & St. P.	1,080,000	1,763,905	I. 216,104	12.1
Chi. & W. Mich.	112,314	108,278	I. 4,036	3.7
Cin. N. O. & T. P.	246,523	203,917	I. 42,606	20.8
Ala. Gt. South.	110,954	88,872	I. 22,082	24.7
N. Ori. & N. E.	46,432	46,886	D. 454	.9
Vicks. & Mer.	33,057	37,506	D. 4,449	11.8
V. Sare. & P.	23,222	31,291	D. 8,069	34.3
Cle. R. & Ft. W.	34,090	29,494	I. 4,596	15.5
Cleve. Ak. & C.	46,988	43,707	I. 3,281	7.2
Cl. C. & C. I.	305,549	268,814	I. 36,735	13.6
Cleve. & Mar.	25,961	21,491	I. 4,470	20.7
Col. & Cin. Mid.	22,283	17,045	I. 5,238	30.7
Denver & R. G.	582,000	484,654	I. 97,346	20.0
Den. & R. G. W.	73,000	67,800	I. 5,200	7.6
K. C. Ft. & S.	33,900	11,570	I. 22,330	193.7
Evans. & T. B.	16,118	11,130	I. 4,988	44.9
Flint & Pere Mar.	220,081	203,161	I. 16,920	8.2
Fla. Ry. & N. Co.	86,451	73,072	I. 13,379	17.3
Georgia Pacific.	80,169	62,377	I. 17,792	28.5
Grand Rap. & I.	186,283	154,378	I. 31,905	20.6
Gr. Trunk of C.	1,275,251	1,215,428	I. 59,823	4.9
Ill. Cent.	166,843	160,007	I. 6,836	4.2
Ill. Div.	321,310	433,198	I. 88,112	20.3
So. Division.	269,280	261,601	I. 7,679	2.9
C. F. & M.	6,672	13,582	D. 6,910	51.5
Dub. & S. C.	62,985	65,276	D. 2,291	3.3
I. F. & S. C.	44,107	44,402	D. 295	.6
Ind. Dec. & Spr.	23,887	20,744	I. 3,143	15.1
K. C. & W.	191,214	206,494	D. 15,280	7.7
K. C. Spr. & M.	143,309	124,906	I. 18,403	14.6
K. C. Chic. & S.	19,690	18,341	I. 1,349	7.4
Keokuk & West.	21,712	19,698	I. 2,014	10.2
Lehigh & Hudson.	21,624	19,605	I. 2,019	10.3
Lou. Ev. & St. L.	78,541	63,318	I. 15,223	24.0
L. N. O. & Tex.	116,198	94,470	I. 21,728	22.9
Manhattan Elev.	117,043	65,445	I. 51,598	78.8
Mex. & Pac.	354,191	311,554	I. 42,637	13.6
Mexican National:				
Southern Div.	103,483	87,992	I. 15,491	17.6
Min. St. C. & W.	40,440	18,588	I. 21,852	117.4
Min. & N. W.	71,556	31,267	I. 40,289	128.7
Nash. C. & St. L.	222,720	172,812	I. 49,908	28.8
N. Y. C. & H. R.	2,901,740	2,363,544	I. 538,196	22.7
N. Y. Out. & W.	119,425	94,353	I. 24,472	25.7
Oregon R. & N.	407,250	407,973	D. 723	.2
Pitt. & West.	168,093	124,733	I. 43,360	34.7
Rich. & Danville.	323,400	320,797	I. 2,603	.8
Va. Mid. Div.	112,900	118,900	D. 6,000	5.0
Chas. C. & A.	48,300	53,862	D. 5,562	10.3
Col. & Gr. Div.	39,000	41,003	D. 2,003	4.8
West. N. C. Div.	42,000	40,083	I. 1,917	3.2
Sw. O. & W.	8,500	8,400	I. 100	1.2
L. A. & T. H.	98,177	86,534	I. 11,643	13.4
Branches.	73,575	41,238	I. 32,337	78.4
Texas & Pacific.	385,383	422,789	D. 37,406	8.8
Valley (Ohio).	50,205	44,515	I. 5,690	12.7
Wis. & Minn.	72,302	10,415	I. 55,887	340.7
Total (gross)....	\$16,425,685	\$14,211,185	I. \$2,214,500	15.5

Month of March:	1887.	1886.	Inc. or Dec.	P. c.
Atch. T. & S. F.	\$1,762,627	\$1,393,352	I. \$369,275	26.5
Net earnings...	974,157	578,698	I. 395,459	68.9
Cape F. & Y. V.	22,792	20,950	I. 1,842	8.7
Net earnings...	19,774	12,586	I. 7,188	57.2
Cl. C. & C. I.	400,960	314,322	I. 86,638	27.5
Net earnings...	172,721	103,494	I. 69,227	66.8
Den. & R. G. W.	84,542	83,868	I. 674	.8
Net earnings...	22,385	27,136	D. 4,751	17.5
E. Ten. Va. & G.	414,382	344,023	I. 70,359	20.4
Net earnings...	85,218	84,486	I. 732	.8
Min. & St. L.	162,071	142,712	I. 19,359	13.5
Net earnings...	65,792	67,081	D. 1,289	1.9
Oreg. Imp. Co.	299,916	186,029	I. 113,887	61.4
Net earnings...	73,707	36,963	I. 36,744	99.6
Tol. & Ohio Cen.	78,837	55,952	I. 22,885	40.8
Net earnings...	25,528	19,894	I. 5,634	28.3
Total (gross)....	\$3,226,127	\$2,457,217	I. \$768,910	31.2
Total (net)....	1,430,282	919,248	I. 511,034	55.5

Three months—Jan. 1 to March 31:	1887.	1886.	Inc. or Dec.	P. c.
Atch. T. & S. F.	\$4,311,682	\$3,228,962	I. \$1,082,720	33.5
Net earnings...	2,045,348	1,324,083	I. 721,265	54.5
Cape F. & Y. V.	67,689	58,844	I. 8,845	15.0
Net earnings...	33,875	33,813	I. 662	1.9
Cl. C. & C. I.	1,343,954	1,075,797	I. 268,157	24.9
Net earnings...	322,653	146,674	I. 175,979	119.9
C. C. C. & I.	1,033,681	802,575	I. 231,106	28.8
Net earnings...	364,284	253,375	I. 110,909	43.3
Den. & R. G. W.	226,822	211,458	I. 15,364	7.2
Net earnings...	56,234	38,822	I. 17,412	44.8
Des. M. & Ft. D.	79,186	88,829	D. 9,643	10.8
Net earnings...	19,284	35,967	D. 16,683	85.9
E. Ten. Va. & G.	1,233,152	1,009,440	I. 223,712	22.1
Net earnings...	352,022	308,704	I. 43,318	14.0
Nash. C. & St. L.	757,288	557,521	I. 199,767	35.8
Net earnings...	315,458	219,592	I. 95,866	43.6
N. Y. C. & H. R.	395,475	245,211	I. 150,264	61.2
Net earnings...	139,143	106,869	I. 32,274	30.1
Min. & St. L.	383,282	337,090	I. 46,192	13.7
Net earnings...	103,150	82,893	I. 20,257	24.4
Oregon Imp. Co.	795,857	565,435	I. 230,422	40.7
Net earnings...	134,825	71,430	I. 63,395	88.5
Tol. & Ohio Cen.	242,527	168,588	I. 73,939	43.9
Net earnings...	92,016	46,779	I. 45,237	96.7
Total (gross)....	\$10,810,879	\$8,459,726	I. \$2,351,153	27.7
Total (net)....	4,051,426	2,690,008	I. 1,361,418	50.6

Nine months—July 1 to March 31:  
E. Ten. Va. & G. \$3,624,907 \$3,237,652 I. \$387,255 11.8  
Net earnings... 1,442,423 1,289,970 I. 152,453 11.8  
Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

## Sugar by the Canadian Pacific.

The Canadian Pacific road has secured for transportation across the continent, 8,000,000 pounds of sugar in addition to 2,000,000 pounds shipped last week. It is thought that the American Refinery, of San Francisco, is the shipper.

### Cotton.

Cotton movement for the week ending May 13 is reported as below, in bales:

Interior markets:	1887.	1886.	Inc. or Dec.	P. c.
Receipts.....	6,236	19,833	D. 13,597	68.5
Shipments.....	20,232	40,904	D. 20,672	50.5
Stock.....	72,510	200,056	D. 127,546	63.7
Seaports:				
Receipts.....	12,666	34,754	D. 22,088	63.5
Exports.....	13,773	67,634	D. 53,861	79.6
Stock.....	395,550	615,118	D. 219,568	55.0

Total movement from plantations for the crop year ending May 13 was 6,254,146 bales, against 6,318,421 last year, 5,558,416 in 1884-85, and 5,575,062 in 1883-84.

The coal tonnage of the Pennsylvania road for the week ending May 7 was as follows:

Line of road.....	Coal.	Coke.	Total.	1886.
.....	174,298	34,880	209,178	175,846
From other lines.....	.....	.....	.....	96,828

Total..... 174,298 34,880 209,178 272,674  
Year to date..... 3,606,635 1,497,117 5,103,752 3,862,064

Decrease for the week, 63,496 tons, or 23.3 per cent.; increase for the year, 1,241,688 tons, or 32.1 per cent.

### Coal.

Coal tonnages for the week ending May 14 are reported as follows:

	1887.	1886.	Inc. or Dec.	P. c.
Anthracite.....	646,183	594,065	I. 52,118	8.7
Bituminous.....	239,510	132,792	I. 106,718	80.3
Coke (May 7).....	34,880	78,871	D. 43,991	55.7

Cumberland coal shipments for the week ending May 14 were 58,475 tons, and for the year to that date 1,120,849 tons, an increase of 744,170 tons as compared with corresponding period last year.

### East-bound Shipments.

The shipments of all freight except live stock from Chicago to seaboard points amounted last week to 28,742 tons, against 30,057 tons the week previous. The percentages of the various roads were as follows: Baltimore & Ohio, 17.5; Chicago & Grand Trunk, 14.1; Pittsburgh, Cincinnati & St. Louis, 8.6; Lake Shore & Michigan Southern, 19.2; Michigan Central, 11.7; New York, Chicago & St. Louis, 8.2; Pittsburgh, Ft. Wayne & Chicago, 19.3; Cincinnati, Indianapolis, St. Louis & Chicago, 1.4.